SELECTED WATER RESOURCES ABSTRACTS

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A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

STRUCTURE OF LIQUID WATER. III. THERMODYNAMIC PROPERTIES OF LIQUID DEUTERIUM OXIDE,
Cornell Univ., Ithaca, N.Y.
J. C. Owicki, B. R. Lentz, A. T. Hagler, and H. A. Scheraga.
Journal of Physical Chemistry, Vol 79, No 22, p 2352-2361, Oct. 23, 1975. 10 fig, 45 ref, 7 tab.

Descriptors: *Water structure, *Heavy water, Thermodynamics, Water, Molecular structure, Hydrogen bonding, Chemical properties, Isotope studies, Inorganic compounds, Deuterium.

A statistical thermodynamic treatment of a cluster model for liquid water is adapted to deuterium oxide. When compared with the results of the theory for water, the principal thermodynamic quantities for deuterium oxide are fit with slightly less accuracy, but the signs of the isotopic differences in these quantities are predicted correctly. The intermolecular vibrational spectral density of deuterium oxide is calculated (as a function of temperature) from the normal mode vibrational frequencies of the clusters and the distribution of cluster sizes. The theory indicates the occurrence of only very few clusters containing more than six molecules, the same conclusion reached for water. Also, the fraction of loosely bonded noncyclic clusters of deuterium oxide increases with increasing temperature, as was found for water. The results suggest that the energy required to break hydrogen bonds in liquid deuterium may be smaller than that for liquid water. The similarities between the theoretical equilibrium cluster distributions and fractions of unbroken hydrogen bonds for deuterium oxide and water imply that these liquids are structurally similar. Most of the thermodynamic differences between liquid deuterium oxide and water are attributable to isotopic effects on the intra- and intermolecular vibrational frequencies of the water clusters rather than to differences in the structures of the two liquids. (Witt-IPC)
W76-02505

A LOCAL-STRUCTURE MODEL FOR CALCULATION OF LATTICE VIBRATIONS IN LIQUID WATER,
Kansas State Univ., Manhattan.
J. Bandekar, and B. Curnutte.
Journal of Molecular Spectroscopy, Vol 58, No 2, p 169-177, November, 1975. 2 fig, 16 ref, 2 tab.

Descriptors: *Water structure, *Model studies, Heavy water, Structure, Water, Structural models, Vibrations, Ice, Molecular structure, Deuterium, Mathematical models.

The local-structure model of Bryan and Curnutte (cf. Journal of Molecular Spectroscopy, Vol 41, No 3, p 512-533, March, 1972), which treated a single molecule in a rigid cage, has been extended to include a central water molecule and its four nearest neighbors surrounded by a rigid cage of next-nearest neighbors. The influence of the next-nearest neighbors is accounted for by the average forces they exert on the five-molecule local-structure group. With parameters based on water at 25C, calculations are given of the spectra of liquid water and deuterium oxide at 25C and for ice I. The results of the calculations are compared with observed spectra and with recent molecular-dynamics calculations. (Witt-IPC)
W76-02512

2. WATER CYCLE

2A. General

A WATERSHED VOLUME RESPONSE MODEL CONSIDERING CONTRIBUTING AREA,
Arizona Univ., Tucson. Dept. of Watershed Management.
R. T. Patten.
Master of Science Thesis, 1975, 65 p, 8 fig, 9 tab, 34 ref, append.

Descriptors: *Watersheds(Basins), *Runoff forecasting, *Rainfall, *Rainfall-runoff relationships, *Evapotranspiration, *Model studies, Hydrology, Water yield, Watershed management, Infiltration, Rainfall intensity, Runoff, Rainfall disposition, Slopes, Distribution patterns, Synthetic hydrology, Regression analysis, Interception, Storage, Storm runoff, Climatology.
Identifiers: Contributing areas.

The model developed is a function of three parameters; two are measurements of rainfall volume and its distribution with time, and the third is based on the monthly potential evapotranspiration rates of the region and is calculated from historical records. The model is developed with a multiple regression equation that incorporates these 3 parameters into 2 variables and a single expression that considers losses as a result of infiltration, interception, and detention. A measurement of the storm duration is the only additional parameter necessary for that equation. Contributing area, which is a significant parameter, is found to be variable with time depending on climatic conditions of the season. When several watersheds are compared using independent data in the model, their contributing areas vary in response to physical properties of the watersheds, such as soil type and distribution. (Robinett-Arizona)
W76-02523

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona University, Tucson, Dept. of Watershed Management.
W. T. Hanes.
Master of Science Thesis, 1975, 83 p, 17 fig, 8 tab, 32 ref, 3 append.

Descriptors: *Snowmelt, *Precipitation(Atmospheric), *Runoff forecasting, *Simulation analysis, *Probability, Runoff, Snow, Watersheds(Basins), Water yield, Model studies, Simulated rainfall, Computers, Synthetic hydrology, Systems analysis, Rainfall-runoff relationships, Forecasting, Frequency analysis, Statistical methods.
Identifiers: Probability distribution.

This study attempts to develop a long-term forecast technique which will produce as its output a probability distribution of future runoff, rather than a single value as previous techniques have done. A deterministic watershed model is used as the basis of the forecasting technique, in addition to a sequence, event-based stochastic precipitation model to provide daily precipitation data inputs for the watershed model. A number of sets of inputs are run through the watershed model to produce an equal number of predictions of total seasonal runoff. A relative frequency distribution of total seasonal runoff is then plotted to which a probability density function may be fitted. The percent error between the actual mean precipitation received per season and the mean precipitation received per season of the simulated data was approximately 10 percent for all forecast periods. If adequate data is available to optimize and test the watershed model used, then there appear to be no major limitations in using the methodology developed in this report for other areas. A group rather than a sequence-based precipitation model may be more appropriate for application in other regions. (Robinett-Arizona)
W76-02664

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1973.
Australian Water Resources Council Canberra.
Australian Government Publishing Service, Canberra, 1975. 431 p, append.

Descriptors: *Water resources, *Research and development, *Projects, *Australia, Bibliographies, Abstracts, Water sources, Groundwater, Surface waters, Water pollution, Water quality, Data collections, Data processing, Hydrology, Hydraulics, Meteorology.

This Inventory covers research into water resources and directly related matters, and includes research projects in progress during the calendar year 1973, including those completed or proposed to commence during that period. The information included was sought by means of a letter circulated to 300 research units in September 1973. A copy of the letter and the suggested form of return and project classification guide which accompanied the letter is included in Appendix I. For the purpose of the Inventory, a research project is defined as one which is designated to reveal new principles, techniques, or methods, to make comparative studies, or to determine applicability in new situations. The basis of the Inventory is the collection of 'Project Details' which are essentially in the form received from co-operating research units. Projects have been grouped on the basis of the research unit performing the research. Indexes are included by subject, by water resources research categories, by research personnel, and by research institutions. (Sims-ISWS)
W76-02680

REVIEW OF MODELS OF TIDAL WATERS,
Monash Univ., Clayton (Australia), Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W76-02689

THUNDERSTORM PRECIPITATION EFFECTS ON THE RAINFALL-EROSION INDEX OF THE UNIVERSAL SOIL LOSS EQUATION,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
K. G. Renard, and J. R. Simanton.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 47-55, 9 fig, 1 tab, 13 ref.

Descriptors: *Erosion, *Erosion rates, *Thunderstorms, *Southwest, *Rainfall-runoff relationships, Precipitation(Atmospheric), Climatic data, Watersheds(Basins), Precipitation gages.
Identifiers: *Universal soil loss equation, Erosion index.

The Universal Soil Loss Equation (USLE) is widely used for estimating annual and individual storm erosion from field-sized watersheds. Records from a single precipitation gage in climatic areas dominated by thunderstorms can be used to estimate the erosion index (EI) only for the point in question on individual storms or for a specific annual value. Extrapolating the results for more than about a mile leads to serious error in estimating the erosion by the use of the USLE. Short time intervals must be used to obtain an adequate estimate of the EI when using the USLE. The variability of the annual EI can be approximated with a log-normal distribution. All studies indicated that in-

vestigations are needed to facilitate estimating the average annual EI from precipitation data as reported by state climatological summaries for states west of the 104th meridian. Additional work is needed to facilitate estimating the EI value from the precipitation data available in most areas of the Southwest where thunderstorms dominate the rainfall pattern. (McLachlan-Arizona)
W76-02740

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02875

NONPOINT SOURCE MINERAL WATER QUALITY MODEL,
Tennessee Valley Authority, Knoxville. Hydraulic Data Branch.
For primary bibliographic entry see Field 5B.
W76-02922

A STOCHASTIC RAINFALL MODEL AND STATISTICAL ANALYSIS OF HYDROLOGIC FACTORS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
R. B. Corotis.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 948, $7.00 in paper copy, $2.25 in microfiche. National Science Foundation Report NUCE-ST74-15, December 1974. 177 p, 24 fig, 11 tab, 82 ref, 4 append. NSF Grant GK-37442.

Descriptors: *Model studies, *Thunderstorms, *Hydrology, *Mathematical models, *Stochastic processes, Rainfall, Runoff, Precipitation(Atmospheric), Watersheds(Basins), Streamflow, Regression analysis, Floods, Flood forecasting, Flood plains, Cities, Urban runoff, Probability, Urban hydrology, Urbanization, Computer programs.

The observed behavior of thunderstorm-type activity has been used to formulate a multidimensional stochastic model of the understorm process. The physical model of observed activity was used to describe the process, and probability distributions were assigned to all the variables in the process that might be considered random variables. This model follows the hourly development of storms in terms of thunderstorm clouds and rainfall-producing convective cells. Several different theoretical aspects associated with rainfall and runoff were discussed. A somewhat simplified thunderstorm model was used to derive a probability distribution for instantaneous rainfall. The effect of urbanization on both rainfall and runoff, and a statistical regression analysis relating flood damage to characteristics of the watershed basin, precipitation data, and streamflow data were described. The use of decision theory analysis was illustrated for design when there is uncertainty due to potential flood damage. Computer programs and input data were listed in appendixes. (Sims-ISWS)
W76-02928

CONJUNCTIVE AVAILABILITY OF SURFACE AND GROUND WATER IN THE ALBUQUERQUE AREA, NEW MEXICO: A MODELLING APPROACH,
Maine Univ., Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-02936

ASCE URBAN WATER RESOURCES RESEARCH PROGRAM,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Program.
M. B. McPherson, and G. F. Mangan, Jr.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11445, p 847-855, July 1975. 13 ref, 2 append. OWRTC-5045(No 4224)(3).

Descriptors: *Urban hydrology, *Reviews, *Water resources, *United States, Bibliographies, Comprehensive planning, Programs, Hydraulics, Management, Cities, Research and Development, Urbanization, Planning, Publications.

Since 1967 the ASCE Program has served as the full-time operating arm of the ASCE Urban Water Resources Research Council. The basic purpose of the program is to help establish coordinated long-range research on urban water resources on a national scale. Briefly summarized is the progress made through mid-1974 on research needs assessment, urban water management, translation of research findings into practice, facilitation of urban runoff research, and collaboration and participation in research of local governments and other organizations. Also noted are activities scheduled for 1974-1975. Included are annotated citations of all 28 program reports and technical memoranda. (Terstriep-ISWS)
W76-02939

REMOVAL OF PERIODICITIES BY DIFFERENCING AND MONTHLY MEAN SUBTRACTION,
Purdue Univ., Lafayette, Ind. Schools of Engineering.
M. L. Kavvas, and J. W. Delleur.
Journal of Hydrology, Vol 26, No 3/4, p 335-353, August 1975. 4 fig, 7 ref, append. OWRT B-036-IND(11).

Descriptors: *Times series analysis, *Runoff, *Rainfall, *Analytical techniques, *Stochastic processes, *Synthetic hydrology, Statistical methods, Seasonal, Model studies, Hydrologic data, Frequency.
Identifiers: *Circularly stationary components, Spectral analysis, ARMA model.

A monthly hydrologic time series, rescaled to obtain a constant variance, has a spectrum which, in turn, has a discrete and a continuous part representing the contributions of the circularly stationary (periodic) and stationary random components, respectively. A spectral representation can be constructed for this mixed spectrum which is observed in monthly runoff and rainfall time series. Seasonal and nonseasonal differencing and monthly mean subtraction methods for the removal of the circularly stationary (periodic) component were analyzed making use of this spectral representation for the case of monthly series. It was shown both analytically and by an example that seasonal differencing removes and nonseasonal differencing effectively reduces the periodicity in the covariance function. Both kinds of differencing greatly distort the original spectrum, wiping out the original spectral contribution at the origin and greatly reducing it near the origin. Fitting an ARMA model with few parameters to the distorted spectrum is almost impossible and the fitted models are impractical for hydrologic simulation since they either yield an infinite variance or are undefined at the spectral origin. Subtraction of monthly means completely removes the periodicity in the covariance but introduces a nonstationarity which is neglibible for practical purposes. This transformed hydrologic series is suitable for generation of synthetic monthly streamflows and rainfalls. (Singh-ISWS)
W76-02944

SEDIMENT YIELD OF SELECTED WATERSHEDS WEST OF THE GREAT PLAINS,
Arizona Univ., Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 2J.
W76-02971

2B. Precipitation

CLIMATES AND VEGETATION PATTERN ACROSS THE MOJAVE/GREAT BASIN DESERT TRANSITION OF SOUTHERN NEVADA,
Cincinnati Univ., Ohio. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W76-02525

VEGETATION OF THE SANTA CATALINA MOUNTAINS, ARIZONA. V. BIOMASS, PRODUCTION AND DIVERSITY ALONG THE ELEVATION GRADIENT,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Ecology and Systematics Section.
For primary bibliographic entry see Field 2I.
W76-02532

AN EXCEPTIONAL DESERT RAINSTORM AT KUFRA, LIBYA,
Centre for Overseas Pest Research, London (England).
D. E. Pedgley.
Weather, Vol 29, No 2, p 64-71, 1974. 4 fig, 14 ref.

Descriptors: *Rainfall, *Meteorology, *Cloudbursts, *Arid lands, Deserts, Synoptic analysis, Meterological data, Weather forecasting, Air masses, Atmospheric physics, Storm structure, Storms, Cloud physics.
Identifiers: *Kurfa(Libya), Inter-tropical conversion zone, Troposphere.

Kufra is a remote group of oases lying in the desert of south-east Libya having an annual average rainfall of about 2 mm and many years having none. On August 25, 1952, there was a rainfall of 11.2 mm. The synoptic processes which led to the storm are described. The available evidence strongly suggests that the remarkable storm at Kufra was associated with an exceptional northward surge of the surface inter-tropical convergence zone to about 24 degrees N, combined with an exceptional occurrence of moist southerly winds in mid-troposphere. Both of these events were very probably consequences of the remarkable westward movement at low latitudes of a small but persistent cyclonic circulation in mid-troposphere across the Near East and north-east Africa. The result was development of deep convective clouds at Kufra followed by a cool downdraft squall and pressure jump. (Robinett-Arizona)
W76-02533

THE DESIGN AND PERFORMANCE OF A 6-CUP ANEMOMETER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 7B.
W76-02553

THE ICE NUCLEATING PROPERTIES OF AN ULTRAFINE AEROSOL OF PURE SILVER IODIDE,
Paris-6 Univ. (France). Laboratoire de Meteorologie.
M.-M. Poc, and M. Roulleau.
Journal of Applied Meteorology, Vol 14, No. 6, p 1146-1150, September 1975. 3 fig, 30 ref.

Descriptors: *Nucleation, *Silver iodide, *Laboratory tests, Aerosols, Cloud seeding, Ice, Crystals, Chemistry of precipitation, Precipitation(Atmospheric), Meteorology.

A silver iodide aerosol was prepared under clean conditions. The method was to react iodine vapor with a silver aerosol in an inert dry atmosphere and in darkness. Great care was taken to avoid contamination form atmosphere air. The ice

nucleating properties of the ultrafine AgI aerosol obtained were studied in a cloud mixing chamber: The aerosol was found to be strangely inactive for temperatures higher than -20C. At -20 C, the 10-30 angstrom particles produced 2 times 10 to the 14th power ice crystals per gram of AgI. (Sims-ISWS)
W76-02554

SILVER IODIDE AEROSOL PRODUCTION BY A PLATED HOT-WIRE GENERATOR,
Wisconsin Univ., Madison. Dept. of Meteorology.
W. R. Barchet, and R. S. McKenzie.
Journal of Applied Metorology, Vol 14, No. 6, P 1151-1155, September 1975. 6 fig, 1 tab, 14 ref. NSF ESR72-03349.

Descriptors: *Silver iodide, *Nucleation, *Laboratory tests, Aerosols, Generators, Cloud seeding, Ice, Crystals, Condensation, Precipitation(Atmospheric), Meteorology.
Identifiers: Hot-wire generators.

There are requirements for a laboratory source of pure silver iodide aerosol with long-term output stability. Aerosol generation by a powder-coated hot wire is unsatisfactory. A method of filament preparation providing a uniform, tightly bound layer of silver iodide on a nichrome heating filament was presented. Size, condensation activity, and ice nucleation properties of silver iodide particles produced by a plated filament met laboratory needs. Long-term stability of aerosal output was an important added benefit. (Sims-ISWS)
W76-02555

A DIGITIZED RADAR FOR PRECIPITATION MEASUREMENTS AND APPLICATIONS TO HYDROLOGY,
Kansas State Univ., Manhattan. Dept. of Electrical Engineering.
D. R. Hummels.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 067, $3.50 in paper copy, $2.25 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution Number 170, August 1975. 12 p, 5 fig, 3 ref. OWRT A-167-KAN(1). 14-31-0001-4116.

Descriptors: Precipitation(Atmospheric), Measurement, Radar, Instrumentation, Meteorology, Digital computers, Graphic methods, Storms, Monitoring.
Identifiers: *Radar precipitation measurement, *Radar hydrology, Radar processor, Radar meteorology.

The major objective was to design a digital processor to interface a meteorological radar with an online minicomputer and CRI graphic terminal. The resulting system will be used to measure precipitation in real time and to monitor severe storms. The processor is designed to quantitize the radar image into range-azimuth cells and transfer an integrated image intensity for each cell to computer memory. After transfer to memory, the intensity data are converted to precipitation rate and cumulative precipitation by computer software. Capability will also be provided for recalling the image or other data for display on a CRT graphic terminal. For convenience in design and assembly the processor was divided into two units, a video integrator and A/D converter unit and a radar computer interface unit. The general characteristics of these two units are summarized.
W76-02635

THE HISTORICAL POTENTIAL OF SNOWFALL AS A WATER RESOURCE IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 3B.
W76-02675

CONTROLLED GENERATION OF LARGE VOLUMES OF ATMOSPHERIC CLOUDS IN A GROUND-BASED ENVIRONMENTAL CHAMBER,
National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center.
H. J. Hettel, R. G. de Pena, and J. A. Pena.
Available from the National Technical Information Service, Springfield, Va 22161. NASA Technical Memorandum TMX-3266, August 1975. 21 p, 13 fig, 1 tab.

Descriptors: *Clouds, *Cloud physics, *Research facilities, Atmosphere, Condensation, Laboratories, Instrumentation, Equipment, Facilities, Research and development, Meteorology.
Identifiers: *Cloud chambers, Cloud generation.

Atmospheric clouds have been generated in a 23,000-cubic-meter environmental chamber as the first step in a two-part study on the effects of contaminants on cloud formation. The program was proposed by Pennsylvania State University's Department of Meteorology and was sponsored jointly by NSF and NASA. The generation procedure was modeled on the terrestrial generation mechanism so that naturally occurring microphysics mechanisms are operative in the cloud generation process. Temperature, altitude, liquid water content, and convective updraft velocity could be selected independently over the range of terrestrially realizable clouds. To provide cloud stability, a cotton muslin cylinder 29.3 meters in diameter and 24.4 meters high was erected within the chamber and continuously wetted with water at precisely the same temperature as the cloud. The improved instrumentation--which permitted fast, precise, and continual measurements of cloud temperature and liquid water content--was described. (Sims-ISWS)
W76-02686

RAIN SCAVENGING OF SO2 AND SULFATE FROM POWER PLANT PLUMES,
Battelle-Pacific Northwest Labs., Richland, Wash. Atmospheric Sciences Dept.
For primary bibliographic entry see Field 5A.
W76-02712

DEVELOPMENT AND TESTING OF A LASER RAIN GAGE,
Colorado State Univ., Fort Collins.
A. D. Ozment.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 185-190, 2 fig, 1 tab, 5 ref.

Descriptors: *Rain gages, *Rainfall, *Distribution patterns *Testing procedures, *Measurement, On-site-tests, Precipitation(Atmospheric), Circulation, Evaporation.
Identifiers: *Laser rain gage.

Current catchment methods of measuring precipitation have several problems which affect their accuracy. The physical presence of the gage disturbs windflow patterns and reduces catch. Other errors of less significance arise from evaporation from the gage, and wetting of the gage. A method is described of measuring precipitation by scattering light from a beam by waterdrops. The sampling medium is a collimated beam from a helium-neon laser. The amount of light scattered is a function of the number and size of drops intercepting the beam. (McLachlan-Arizona)
W76-02752

A STOCHASTIC RAINFALL MODEL AND STATISTICAL ANALYSIS OF HYDROLOGIC FACTORS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-02928

2C. Snow, Ice, and Frost

FILLING AND EMPTYING SYSTEM FOR ICE HARBOR LOCK, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-02536

METHODS OF AVALANCHE CONTROL ON WASHINGTON HIGHWAYS, FOURTH ANNUAL REPORT,
Washington Univ., Seattle. Dept. of Geophysics; and Washington Univ., Seattle. Dept. of Civil Engineering.
C. B. Brown, R. J. Evans, D. M. McClung, E. R. LaChapelle, and M. B. Moore.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 269, $5.00 in paper copy, $2.25 in microfiche. Washington State Highway Department, Olympia, Research Program Report 8.5, July 1974. 76 p, 27 fig, 2 tab, 21 ref, append.

Descriptors: *Avalanches, *Snow, *Washington, *Highways, Snow cover, Snowpacks, Creep, Forecasting, Weather, Temperature, Mountains, Hazards, Mechanical properties, Surveys.
Identifiers: *Avalanche forecasting, *Cascade Mountains(Wash).

Reports were collected about avalanche conditions and avalanche prevention measures on Washington mountain highways in general and to the North Cascade Highway in particular. Included were various aspects of creep deformation and glide of the snow cover as they affect avalanche defense structure design, reconnaissance of a proposed new highway route through the Cascade Mountains, and a continuing study of the relationship between synoptic winter weather patterns and the formation and distribution of snow avalanches in the Cascades. The reports were entitled: (1) Effect of Glide and Creep on Rigid Obstacles, by C.B. Brown and R.J. Evans; (2) Creep and the Snow-Earth Interface Condition in the Seasonal Alpine Snow-Pack, by D.M. McClung; (3) In-Situ Investigations of the Temperature Dependence of the Creep of Low Density Snow, by D.M. McClung; (4) Naches Tunnel Avalanche Reconnaissance, by E.R. LaChapelle; and (5) Investigation of Synoptic and Surface Weather Situations Leading to Major Avalanche Cycles in the Washington Cascades for the 1973-74 Winter, by M.B. Moore. (Sims-ISWS)
W76-02546

FREEZEUP PROCESSES ON ARCTIC BEACHES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
A. D. Short, and W. J. Wiseman, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-003 373, $3.50 in paper copy, $2.25 in microfiche. ARCTIC, Journal of the Arctic Institute of North America, Vol 27, No 3, p 215-224, September 1974. 7 fig, 13 ref. NR 388-110. ONR N00014-69-A-0211-0005.

Descriptors: *Freezing, *Beaches, *Ice, *Alaska, Slush, Berms, Sediments, Coasts, Estuaries, Arctic, Islands, Winter.
Identifiers: *Point Lay(Alaska), *Pingok Island(Alaska), Freezeup processes, Ice-slush berms, Ice-sediment interbedding.

Observations made along the northern Alaskan coast during 1972 served to indicate the processes by which arctic winter beach features are formed. In sub-zero (centigrade) temperatures, ice forms on the surface of brackish lagoonal and estuarine water and is often moved offshore by wind-generated and tidal currents. When waves, wind, and storm surges coincide with the presence of ice in the nearshore zone, the ice and frozen swash mass are deposited contiguously with sediment on the beach as distinctive ice and ice-sediment structures. These structures include ice-slush berms, ice-sediment interbedding, and buried ice boulders. (Sims-ISWS)
W76-02551

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona University, Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-02664

THE HISTORICAL POTENTIAL OF SNOWFALL AS A WATER RESOURCE IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 3B.
W76-02675

AN IMPROVED RECORDING GAGE FOR BLOWING SNOW,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Watershed Lab.
For primary bibliographic entry see Field 7B.
W76-02700

COMPUTER SIMULATION OF THE SNOWMELT AND SOIL THERMAL REGIME AT BARROW, ALASKA,
Michigan Univ., Ann Arbor. Dept. of Geography.
S. I. Outcalt, C. Goodwin, G. Weller, and J. Brown.
Water Resources Research, Vol. 11, No. 5, p 709-715, October 1975. 3 fig, 3 tab, 17 ref.

Descriptors: Computer models, *Snowmelt, *Soils, *Alaska, Tundra, Temperature, Model studies, Water supply, Freshwater, Melt water, Snow, Arctic.
Identifiers: *Computer simulation, *Thermal regime, *Barrow(Alaska), Snow-soil simulator, Arctic tundra, Coupled models, Snow ripening, Snowfield, Meltout.

An annual snow-soil simulator for arctic tundra was developed by using coupled models of surface equilibrium temperature and substrate thermal diffusion. Snow ripening, melt, and accumulation were modeled in the simulator which was forced with daily weather data. The simulator predicted that a snow fence array capable of producing drift deeper than 4.2 m would initiate a permanent snowfield at Barrow, Alaska. Such a man-induced snowfield could serve as a reliable source of freshwater for Barrow and similar villages in the north slope region of Asaska. Further analysis indicated that albedo reduction due to dust fall, snow removal, etc., was dominant over aerodynamic effects in producing the early spring meltout observed at Barrow Village. (Roberts-ISWS).
W76-02703

A POSSIBLE RELATION OF ALBEDO TO THE DENSITY AND GRAIN SIZE OF NATURAL SNOW COVER,
Forest Service (USDA), Fort Collins, Colo., Rocky Mountain Forest and Range Experiment Station.
J. D. Bergen.
Water Resources Research, Vol. 11, No. 5, p 745-746, October 1975. 1 fig, 11 ref.

Descriptors: *Albedo, *Density, *Snow cover, *Model studies, Ice, Air, Reflectance, Solar radiation, Cloud cover, Snow, Particle size, Permeability.
Identifiers: Radiant energy, Ice form, Sunlight, Solar spectrum, Solar altitude, Solar energy.

Discussion begins with the fraction of the total solar radiation incident on the snow surface which is absorbed by the snow as sensible heat. A simple model was constructed for this energy, or solar albedo, of natural snow cover. It was based on approximation to the specific surface by a function of grain size and density derived from air permeability tests. Factors which determine solar albedo for a particular snow cover were far from complete. The albedo was found high for a layer of new snow, as high as 91 percent. As the new snow coalesced and coarsened in texture, it fell steadily toward levels of the order of 70 or even 60 percent. It seemed that for grain sizes greater than 1.5 mm, the primary albedo variation was associated with density rather than with grain size. For lower values of grain size, the reverse appeared to be true. (Roberts - ISWS)
W76-02704

BRINE INFILTRATION IN THE MCMURDO ICE SHELF, MCMURDO SOUND, ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. Kovacs, and A. J. Gow.
Journal of Geophysical Research, Vol 80, No 15, p 1957-1961, May 20, 1975. 7 fig, 13 ref.

Descriptors: *Ice, *Brines, *Antarctic, Sea water, Infiltration, Ice-water interfaces, Firn, Glaciers, Snow, Sea ice, Radar, On-site investigations.
Identifiers: *Ice shelves, *McMurdo Ice Shelf, McMurdo Sound.

In recent trials near Hut Point Peninsula an impulse radar profiler was used successfully to monitor the depth characteristics and lateral extent of brine soaking in the McMurdo Ice Shelf. The success of the profiler can be attributed in large part to the significant difference in dielectric properties of dry firn and firn that has become brine soaked by infiltrating seawater. In addition to furnishing continuous trace of the top of the brine layer, the impulse radar profiler has also revealed the existence of cracks, relict brine horizons, and deformational features within the ice shelf. Data tend to favor lateral infiltration of seawater, either through the seaward edge of the ice shelf or via tensile cracks at the bottom of the ice shelf. (Sims-ISWS)
W76-02707

A MODEL OF SIMPLE RAFTING IN SEA ICE,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
R. R. Parmerter.
Journal of Geophysical Research, Vol 80, No 15, p 1948-1952, May 20, 1975. 6 fig, 10 ref. NSF GV-28807.

Descriptors: *Sea ice, *Ice, *Mechanical properties, *Model studies, Mathematical models, Stress, Cold regions, Ice-water interfaces, Ice cover, Ice jams.
Identifiers: *Ice rafting, Ice sheets.

A mechanical model was developed to describe the rafting of ice sheets of equal thickness. Rafting is one of the important deformation mechanisms in thin ice. The model predicted the force required to initiate rafting. This force is an upper bound for the force in pack ice. The model was also used to calculate the bending stress developed by rafting. The stress increases in proportion to the square root of ice thickness. Thus for a given ice strength there is a maximum thickness of ice which can raft without fracturing. For typical young ice properties the calculated value of 17 cm is in good agreement with field observation. (Sims-ISWS)
W76-02708

FREEZE-THAW EFFECTS ON SOILS TREATED FOR WATER REPELLENCY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. H. Fink, and S. T. Mitchell.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 79-85, 1 fig, 4 tab, 9 ref.

Descriptors: *Waterproofing, *Freeze-thaw tests, *Soil texture, *Soil properties, *Water harvesting, Water yield, Watersheds(Basins), Runoff.
Identifiers: *Water repellents.

Water can be supplied to many arid areas by harvesting the precipitation that falls on artifically prepared water-repellent soil catchments. The failure, in 1973, of wax-treated water harvesting carchment led to this study which indicates that the failure was due to swelling and shrinking of the treated soil which caused complete structural breakdown and loss of repellency. The laboratory freeze-thaw studies demonstrated that the smoother the plot, the less chance of freeze-thaw damage. Generally, coarser-textured soil can withstand freeze-thaw cycles better than finer-textured soils. Soil properties, other than texture, may also affect resistance to damage by freeze-thaw cycles. Increasing the repellent application rate may improve resistance to breakdown. (McLachlan-Arizona)
W76-02743

DESCRIBING SNOWPACKS IN ARIZONA MIXED CONIFER FORESTS WITH A STORAGE-DURATION INDEX,
Arizona Univ., Tucson. School of Renewable Natural Resources.
M. A. Warren, and P. F. Ffolliott.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Adademy of Science, April 11-12, 1975, Tempe, Arizona, p 87-89, 1 tab, 9 ref.

Descriptors: *Snowpacks, *Water yield, *Runoff, *Snow management, *Coniferous forests, *Arizona, Snow melt, Vegetation effects, Mixed forests, Forest management, Surface drainage.
Identifiers: *Snow storage.

The quantification of snowpacks in relation to inventory-prediction may be useful in the development of water yield improvement practices involving vegetation management in the mixed conifer forests in Arizona. While mixed conifer forests are relatively limited in extent in Arizona, the potential for water yield improvement by manipulation of snow storage through vegetation management may be high. Sample points on the North Fork of Thomas Creek showed high initial snow storage followed by slow melt in association with low forest densities, low potential insolation values, and high elevation. Sample points exhibiting these conditions also possessed maximum storage-duration index values. Low initial snow storage followed by rapid melt was associated with high forest densities, high potential insolation values, and low elevations. (McLachlan-Arizona)
W76-02744

AERIAL SNOWPACK MAPPING,
Salt River Project, Phoenix, Ariz.
W. L. Warskow.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology

Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 207-213, 1 ref.

Descriptors: *Snowpacks, *Snow surveys, *Snow management, *Snow cover, *Mapping, Snow, Melt water, Snowmelt, Runoff, Snowfall, Watershed management, Aerial photography, On-site investigations.
Identifiers: Maricopa County(Ariz), Salt River Project.

Arizona's continued growth and development depends upon sound management of water resources, especially melted snow which is the primary source of water for the 1.1. million residents of Maricopa County. The method for snowpack information gathering practiced by watershed specialists of the Salt River Project in Arizona is described. The method is outlined, describing aircraft reconnaissance, direct enroute mapping of extent and depth of snowpack, and techniques for identifying ice and/or melt conditions. Under optimal conditions, this technique is considered more than acceptable for determining snowpack levels. Limitations of the technique result from the observer's tolerance of vertigo which can arise under flying conditions; cloud cover, which can reduce contrast and shadows therby reducing accuracy of observation; and vegetation zones where density of plant matter screens much of the snow. (Michael-Arizona)
W76-02755

MEASURING SNOW COVER FROM ERTS IMAGERY ON THE BLACK RIVER BASIN,
Arizona Univ., Tucson. School of Renewable Natural Resources.
J. S. Aul, and P. F. Ffolliott.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 215-219, 1 tab, 14 ref.

Descriptors: *Snowpacks, *Snow surveys, *Snow management, *Arizona, *Snow cover, Remote sensing, Aerial reconnaissance, Satellites(Artificial), Mapping.
Identifiers: Black River Basin(Ariz), Earth Resources Technology Satellites(ERTS).

The possibility of using imagery from the Earth Resources Technology Satellites (ERTS) to monitor changes in areal snow cover in east-central Arizona is examined. Four methods were used in the interpretation of areal snow cover from the ERTS imagery, the Densitometer, Dot Grid, Squares Grid and Projection-Planimeter methods providing results of 69, 71, 72 and 74 percent of areal cover respectively. No one method for interpretation of ERTS imagery should be ruled unusable, but any use made of ERTS imagery is dependent upon turn-around time for obtaining the imagery, as snow cover information which cannot be obtained within 24 hours is limited in practical application. (Michael-Arizona)
W76-02756

SNOWMELT RUNOFF EFFICIENCIES ON ARIZONA WATERSHEDS,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
R. M. Solomon, P. F. Ffolliott, M. B. Baker, Jr., G. J. Gottfried, and J. R. Thompson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 410, $4.50 in paper copy, $2.25 in microfiche. University of Arizona, Agricultural Experiment Station, Research Report 274, Summer 1975. 50 p, 1 ref, append. OWRT A-045-ARIZ(4). 14-31-001-5003.

Descriptors: *Snowmelt, *Arizona, *Runoff forecasting, *Model studies, *Coniferous forests, Water supply, Watershed management, Watersheds(Basins), Regression analysis, Forecasting, Vegetation effects, Environmental effects, Soil moisture, Slopes, Elevation.
Identifiers: *Snowmelt fluctuations, *Runoff efficiency, Snowpack dynamics.

Snowmelt runoff efficiencies are described for fourteen experimental watersheds in Arizona located in different vegetation zones where snowmelt water yield is a significant contributor to the annual water yield budget. Documentation was based on years of record when on-site snow pack water-equivalent measurements were taken on the watersheds. In an attempt to accomplish the identification of inventory-prediction variables affecting snowmelt runoff efficiencies, ten potential variables were assessed on a sub-sample of five experimental watersheds including: (1) forest overstory basal area, (2) forest overstory stems, (3) average watershed slope, (4) average watershed aspect, (5) elevation, (6) drainage density, (7) antecedent moisture prior to snowpack accumulation, (8) total seasonal precipitation, (9) peak snowpack accumulation, and (10) duration of surface runoff. The regression equation empirically relating snowmelt runoff efficiencies to inventory-prediction variables may provide knowledge useful in assessing potential water yield from watersheds. (Barclay-Arizona)
W76-02866

CHARACTERIZATION OF SNOWMELT RUNOFF EFFICIENCIES,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
R. M. Solomon, P. F. Ffolliott, and D. B. Thorud.
In: Proceedings Symposium on Watershed Management, Operational Watershed Management: Research to Application, Logan, Utah, August 11-13, 1975, p 306-326, 1975. 7 fig, 1 tab, 15 ref. OWRT A-045-ARIZ(5). 14-31-001-5003.

Descriptors: *Snowmelt, *Arizona, *Runoff forecasting, Model studies, Forests, Water supply, Regression analysis, Coniferous forests, Watersheds(Basins), Runoff, Forecasting.
Identifiers: *Snowmelt fluctuations, Runoff efficiency, Graphical integration technique.

Snow research efforts have been conducted to more fully understand the processes involved in snowpack accumulation, melt, and resultant runoff. While many of these efforts have been concerned with snowpack dynamics on-site, little work has been directed toward determinations of the portion of a snowpack actually converted into recoverable water. Using runoff efficiency as a descriptor of snowpack depletion-surface relationships, three areas of investigation have been explored: the characterization of changing patterns of runoff efficiency within a snowmelt-runoff season, the identification of factors affecting runoff efficiency within and among seasons, and the assessment of runoff efficiency patterns from year-to-year among small watersheds. These investigations, coupled with knowledge of snowpack dynamics on-site, are necessary to prescribe land management systems that will maximize opportunities for water yield improvement practices. Study areas are from seven small experimental watersheds in the forest zones in Arizona.
W76-02871

USE OF ERTS IMAGERY TO ASSIST IN SNOWMELT FLOOD PREDICTION,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
J. Pennaz, and C. E. Bowers.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 63-80, June 30, 1974. 10 fig. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Snow cover, *Minnesota, Aerial photography, Satellites(Artificial), Snow, Water equivalent, Surveys, Floods, Flood forecasting, Snowmelt, Melt water, Runoff forecasting, Data processing, Mathematical models, Models studies.
Identifiers: *ERTS.

In recent years, severe floods have occured in the upper Midwest. One of the primary problems associated with spring flood prediction is the determination of accumulated water content of snow on the ground. ERTS Imagery has been very helpful in drawing water-content-of-snow lines just prior to the spring melt for 1973 and 1974. This should be very valuable in predicting the magnitude of spring floods if the imagery can be provided promptly to flood forecasters in the period February 1 to March 31 each year. As part of the study, a graphical relationship has been developed between 'Per Cent Snow Cover' and 'Water Content of Snow' for the Upper Midwest. This relationship is necessary for the proper use of some modern mathematical simulation models used in flood forecasting. It is difficult to estimate the value of the ERTS Imagery in this study, but flood damage in the upper midwest has exceeded 300 million dollars in 1965 and 1969; anything that can be done to provide warning and prepare emergency countermeasures will make a significant contribution to the reduction of such damage. The ERTS Imagery has this capability. (See also W76-02901) (Sims-ISWS)
W76-02906

OPTIMAL HEIGHT OF A DAM FOR PRESERVATION OF BEARING GROUND IN A FROZEN STATE,
For primary bibliographic entry see Field 8D.
W76-02910

CALCULATION OF ICE-COVER BENDING ALLOWING FOR VISCOUS PROPERTIES OF ICE,
A. E. IAkunin.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A002 378, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 425, September 1974. 9 p, 1 fig, 4 ref. Translated from Novosibirskiy Institut Inzhenerov Zheleznodorozhnogo Transporta, Trudy, Vol 79, p 72-82, 1968.

Descriptors: *Ice, *Ice loads, *Bearing strength, *Rheology, Elastic deformation, Elasticity(Mechanical), Elastic theory, Mechanical properties, Loads(Forces), Viscosity, Physical properties, Model studies, Mathematical models.
Identifiers: *USSR, *Ice cover strength, Viscoelasticity.

The linear viscoelastic deflections and stresses of a floating ice sheet were considered. Young's modulus was replaced with a Maxwell model in series with a Voight model. The resulting differential equation was solved when the applied load is independent ot time and is linear with time. No numerical results were given but the author said the resulting equations agreed with experiments conducted on the Novosibirsk Reservoir. (Sims-ISWS)
W76-02911

CALCULATING SNOW COVER DENSITY IN THE KYZYLCHA MOUNTAIN RIVER BASIN,
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
Yu. B. Sadvakasov, and Ye. M. Kozik.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A002 066, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 415, September 1974. 8 p, 1 fig, 5 tab, 3 ref. Translated from Meteorologiya i Gidrologiya, No 11, p 77-82, 1970.

Descriptors: *Snow, *Snow cover, *Snow surveys, Distribution patterns, Watersheds(Basins),

Mountains, Temperature, Precipitation(Atmospheric), Winds, Solar radiation, Snowpacks, Snowmelt, Water sources.
Identifiers: *USSR, *Kyzylcha Mountain River Basin(USSR), Snow density.

All information available on snow cover in the Kyzylcha Mountain River Basin was examined. Connections between density and values of meteorological elements were sought for each month between December and April. In most months, th maximum indluence on density of snow cover is exerted by the sums of positive 13 hr temperatures and the total precipitation computed from 1 December to the day of the snow survey. The results obtained suggested that the calculations of the density of snow cover at the time of its bedding in the region of Kyzylcha Station in about 85% of the cases (and in 90% of the cases in the utilization of meteorological data) have an accuracy adequate for paractical purposes. Sims-ISWS)
W76-02912

DESIGN AND CONSTRUCTION OF HYDRAULIC STRUCTURES ON PERMAFROST,
For primary bibliographic entry see Field 8A.
W76-02913

FREEZING OF AN EARTH DAM FROM THE DRY SLOPE SIDE,
For primary bibliographic entry see Field 8D.
W76-02914

VARIATION OF GEOCRYOLOGICAL CONDITIONS BENEATH DAMS DEPENDING ON UPPER TEMPERATURE LIMITS,
For primary bibliographic entry see Field 8D.
W76-02915

THE SPECTRAL DISTRIBUTION OF LIGHT BENEATH FIRST-YEAR SEA ICE IN THE ARTIC OCEAN,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
G. A. Maykut, and T. C. Grenfell.
Limnology and Oceanography, Vol 20, No 4, p 554-563, July 1975. 7 fig, 27 ref. ONR N00014-67-A-0103-0007.

Descriptors: *Sea ice, *Light, *Solar radiation, *Algae, *Artic Ocean, *Alaska, Ice, Energy, Sea water, Oceans, Aquatic life, Phytoplankton, Photosynthesis, Energy conversion, Primary productivity, Optical properties, Light intensity, Light penetration, Physical properties, Nutrients, Water properties, Spectrophotometry.
Identifiers: First-year sea ice, *Spectral distribution, Spectra transmission data, *Point Barrow(Alaska), Artic ice pack, Transmission properties, Photosynthetic organisms, Submersible spectrophotometer, Melt ponds, White ice, Blue ice, Snow-covered ice.

Spectral transmission data in the 400-1,000-nm range were obtained from about 60 sites beneath first-year sea ice near Point Barrow, Alaka. The amount of energy reaching the ocean depended strongly on the nature of the upper surface. Maximum transmission occurred in the 450-550-nm region, regardless of surface conditions or ice thickness. Initial results were influenced by the presence of interstitial algae in the lower part of the ice. The characteristic signature of these algae was a secondary peak at about 540 nm. Results were generalized to provide estimates of the magnitude and composition of downwelling irradiance beneath the types of ice typically encountered in coastal portions of the Arctic Ocean. (Henley-ISWS)
W76-02923

BUILDING DAMS IN PERMAFROST REGIONS,
For primary bibliographic entry see Field 8D.
W76-02925

FIRST RESULTS OF INVESTIGATIONS OF THE WATER BALANCE IN RIVERS IN THE UPPER KOLYMA BASIN,
For primary bibliographic entry see Field 2E.
W76-02926

PECULIARITIES OF FORMATION OF RUNOFF OF THE UPPER KOLYMA BASIN,
A. S. Kuznetsov, and Sh. S. Nasybulin.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 320, $3.25 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 455, February 1975. 18 p, 8 fig, 4 tab, 8 ref. Translated from Magadan Sbornik Rabot Magadanskoy Gidrometeorologicheskoy Observatorii, No 3, p 52-65, 1970.

Descriptors: *Runoff, *Watersheds(Basins), *Permafrost, Cold regions, Mountains, Evaporation, Precipitation(Atmospheric), Rainfall, Snowfall, Snowmelt, Melt water, Streamflow, Rivers, Talus, Hydrology.
Identifiers: *Kolyma Basin(USSR), *USSR.

The upper Kolyma basin is located in the zone of permafrost where the conditions for formation and regime of runoff are characterized by some singularity. The decisive factor in the formation of river runoff is the quantity of precipitation falling in the territory of the basin. It has been estiablished by a study of the water balance for the rivers of this territory that the formation of runoff is dependent on the underlying surface. The greatest runoff is in rivers whose water collecting basins is covered by talus. Ice encrustations occur frequently in this area; these, however, do not increase runoff, but redistribute it in the course of a year. Where permafrost prevails, the losses of rain and meltwater have a temporary character in the active layer. In the upper Kolyma basin evaporation from the soil varies in the range of 120-170 mm; this is approximately two to three times less than from the soil at the same latitudes in the European territory of the USSR. (Sims-ISWS)
W76-02927

GEOPHYSICAL STUDIES OF FLOATING ICE BY REMOTE SENSING,
Geological Survey, Tacoma, Wash.
W. J. Campbell, W. F. Weeks, R. O. Ramseier, and P. Gloersen.
Journal of Glaciology, Vol 15, No 73, p 305-328, 1975. 15 fig, 54 ref.

Descriptors: *Remote sensing, *Sea ice, *Lake ice, *Analytical techniques, *Microwaves, Infrared radiation, Satellites(Artificial), Icebergs, Data collections.
Identifiers: *ESMR imagery, *Floating ice, Seasonal changes.

This paper presents an overview of remote-sensing techniques as applied to geophysical studies of floating ice. The current increase in scientific interest in floating has occurred during a time of rapid evolution of both remote-sensing platforms and sensors. Mesoscale and macroscale studies of floating ice are discussed under three sensor categories: visual, passive microwave, and active microwave. The specific studies that are reviewed primarily investigate ice drift and deformation, and ice type and ice roughness identification and distribution. (Woodard-USGS)
W76-02954

2D. Evaporation and Transpiration

COMPARATIVE PHOTOSYNTHETIC AND RESPIRATORY GAS EXCHANGE CHARACTERISTICS OF ATRIPLEX LENTIFORMIS (TORR.) WATS. IN COASTAL AND DESERT HABITATS,
State Univ. of New York at Albany. Dept. of Biological Sciences.
R. W. Pearcy, and A. T. Harrison.
Ecology, Vol 55, No 5, p 1104-1111, Late Summer, 1974. 6 fig, 1 tab, 20 ref.

Descriptors: *Transpiration, *Photosynthesis, *Plant physiology, *Respiration, *Air temperature, California, Light, Stomata, Phreatophytes, Arid climates, Desert plants, Diurnal, Moisture availability, Water loss, Drought tolerance, Plant growth, Plant populations, Ecological distribution, Carbon dioxide, Water requirements, Coasts, Climates.
Identifiers: Atriplex lentiformis(Torr) Wats.

A species found in the two different thermal regimes of the coastal and desert habitats of southern California is Atriplex lentiformis, a large phreatophytic shrub. This study characterizes the rates of photosynthesis and transpiration of a coastal and desert A. lentiformis population under field conditions in an attempt to determine if gas exchange characteristics could be found that might be adaptively related to the differences in habitat temperature. The diurnal courses of CO2 exchange of the coastal and desert shrubs were remarkably similar. Maximum CO2 uptake rates and stomatal conductances to water vapor were similar in both habitats, occurring at midday when irradiance was highest. The optimum temperature for photosynthesis was 32C for coastal shrubs and 44C for desert shrubs. At temperatures below 36C rates of CO2 uptake were higher in the coastal shrubs, whereas at higher temperatures desert shrubs exhibited a higher rate of CO2 uptake. No evidence of a drought-related midday depression of photosynthetic rates was present, indicating that groundwater supplies are apparently adequate for the desert shrubs. (Robinett-Arizona)
W76-02530

A POSSIBLE RELATION OF ALBEDO TO THE DENSITY AND GRAIN SIZE OF NATURAL SNOW COVER,
Forest Service (USDA), Fort Collins, Colo., Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-02704

ASSESSING BARE SOIL EVAPORATION VIA SURFACE TEMPERATURE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
S. B. Idso, R. J. Reginato, and R. D. Jackson.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 199-205, 5 fig, 19 ref.

Descriptors: *Evaporation, *Transpiration, *Soil moisture, *Soil temperature, Drying, Lysimeters, Soil types, Loam, Thermal properties, Instrumentation, Soil water, Temperature, Arizona.
Identifiers: Phoenix(Ariz).

Evaporation of water from bare soils is an important consideration in the scheduling of many farming operations in both irrigated and dryland agriculture. Accurate predictions of bare soil evaporation can serve as the basis for decisions to increase the acreage planted with a given crop. An alternative is presented to previous approaches to bare soil evaporation estimation by empirically correlating the ratio of daily totals of actual to potential evaporation and the amplitude of the diurnal surface soil temperature wave. Since evaporation is directly related to the surface soil water pressure, the soil thermal inertia technique might be capable of prescribing relative bare soil evaporation rates which, combined with potential evaporation calculations, could allow determination of actual evaporation rates over the entire range of soil drying. (Michael-Arizona)
W76-02754

SAMPLING SOIL-WATER DISTRIBUTION IN THE SURFACE CENTIMETER OF A FIELD SOIL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W76-02924

SODIUM RELATIONS IN DESERT PLANTS: 4. SOME PHYSIOLOGICAL RESPONSES OF ATRIPLEX CONFERTIFOLIA TO DIFFERENT LEVELS OF SODIUM CHLORIDE,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 3C.
W76-02968

2E. Streamflow and Runoff

A WATERSHED VOLUME RESPONSE MODEL CONSIDERING CONTRIBUTING AREA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-02523

NUMERICAL ERRORS IN WATER PROFILE COMPUTATION,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-02688

TIME SERIES ANALYSIS OF A WATERSHED RESPONSE VARIABLE,
Ottawa University (Ontario). Dept. of Civil Engineering.
K. Adamowski, and M. Oosterveld.
Water resources Research, Vol 11, No 5, p 657-660, October 1975. 3 fig, 2 tab, 7 ref.

Descriptors: *Time series analysis, *Watersheds(Basins), *Correlation analysis, *Recession curves, *Storage, Hydrology, Analytical techniques, Rainfall, Geology, Geomorphology, Storage capacity, Size, Discharge(Water), *Canada.
Identifiers: *Spectral analysis, Ontario(Canada), Spectral density, Watershed response.

The daily mean discharge time series was transformed into a dimensionless time series by dividing the flow by the flow on the following day. This dimensionless time series can be statistically described and a flow generation model can be derived which takes into account the physics of the flow as understood through storage models. The properties of the transformation are such that direct comparisons can be made between different watersheds. The derived time series can be considered as being composed of periodic fluctuations reflecting seasonal changes with superimposed random variations. Various components of time series were studied by correlogram and spectral techniques. Three watersheds with varying size, geology, and physiography were selected for investigation. It was found that in watersheds with low storage capacities, the response to precipitation as observed in the discharge hydrographs is governed largely by precipitation characteristics and has the properties of a random time independent process. Response of the watersheds with high storage capacities is dominated by the watershed's geology and can be considered as a time dependent process. (Singh-ISWS)
W76-02699

THE LOG PEARSON TYPE 3 DISTRIBUTION AND ITS APPLICATION IN HYDROLOGY,
National Inst. of Scientific Research, Quebec.
B., Bobee.
Water Resources Research, Vol. 11 No. 5, p 681-689, October 1975. 3 Fig, 4 tab, 10 ref.

Descriptors: *Distribution patterns, *Flood frequency, *Statistical methods, *Streamflow, *Testing procedures, Analytical techniques, Synthetic hydrology, Methodlolgy, Hydrology, Probability.
Identifiers: *Pearson type 3 distribution, Coefficient of skewness, Coefficient of variation, Logarithmic transformation.

The log Pearson type 3 distribution has found intensive use in hydrology, particularly in flood frequency analysis. A statistical part of this study showed the relationship between the coefficient of varition and the coefficient of skewness and indicated the great variety of forms of the density function. A method was proposed for fitting the distribution to historical flows. It maintains the moments of the observed data but does not preserve those of their logarithms. The technique resembles the one which is already used for the log normal distribution when the parameters are estimated by the method of moments. A comparison by simulation of the different methods available is generally desirable in order to get the best possible fitting method. In particular, the mehtod of maximum likelihood even though it does not lead to sufficient estimates and is elaborate, should be considered. (Singh - ISWS)
W76-02701

STUDY OF TIME-LAPSE PROCESSING FOR DYNAMIC HYDROLOGIC CONDITIONS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 4A.
W76-02713

PREDICTING SPRING STREAMFLOW IN CENTRAL ARIZONA,
Oregon State Univ., Corvallis. School of Forestry.
For primary bibliographic entry see Field 4A.
W76-02724

STREAMFLOW HYDROLOGY AND SIMULATION OF THE SALT RIVER BASIN IN CENTRAL ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W76-02731

THE GEOMORPHIC AND HYDRAULIC RESPONSE OF RIVERS,
Colorado State Univ., Fort Collins. Coll. of Engineering.
D. B. Simons.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 21-28, 3 fig, 6 ref.

Descriptors: *Water resources, *Geohydrologic units, *Planning, *Sediments, *Channel flow, *Rivers, Geomorphology, River regulation, Fluvial sediments, Meanders, Analysis.

The importance of water resources and an increasing interest on improvement of out environment have identified the urgent need for methods to predict river response due to various changes resulting from proposed water resource planning. Fluvial geomorphology and hydraulic elements that are related to the interpretation and modeling of response to the problem are presented. Interpretation of alluvial rivers should be preceded by a qualitative analysis and information is presented which should be adequate to carry this out in most cases. This should be followed by a quantitative evaluation of channel response and water sediment routing using theory supplemented by physical and mathematical model studies of the system. (McLachlan-Arizona)
W76-02738

WATERSHED INDICATORS OF LANDFORM DEVELOPMENT,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4D.
W76-02739

VARIATIONS IN THE NATURAL CHEMICAL CONCENTRATION OF RIVER WATER DURING FLOOD FLOWS, AND THE LAG EFFECT: SOME FURTHER COMMENTS,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 5A.
W76-02916

VELOCITY--BED-FORM--TEXTURE PATTERNS OF MEANDER BENDS IN THE LOWER WABASH RIVER OF ILLINOIS AND INDIANA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W76-02919

HIERARCHICAL ATTRIBUTES AND A UNIFYING MODEL OF BED FORMS COMPOSED OF COHESIONLESS MATERIAL AND PRODUCED BY SHEARING FLOW,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W76-02920

FIRST RESULTS OF INVESTIGATIONS OF THE WATER BALANCE IN RIVERS IN THE UPPER KOLYMA BASIN,
A. S. Kusnetsov, Sh. S. Nasybulin, and A. I. Ipat'yeva.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-004 006, $3.75 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 454, February 1975. 33 p, 8 fig, 8 tab, 8 ref. Translated from Magadan Sbornik Rabot Magadanskoy Gidrometeorologicheskoy Observatorii, No 2, p 98-121, 1969.

Descriptors: *Water balance, *Watersheds(Basins), *Runoff, Evaporation, Evapotranspiration, Rainfall, Precipitation(Atmospheric), Snowfall, Snowmelt, Vegetation, Streamflow, Mountains, Rocks, Talus, Moisture, Rivers, Water supply, Cold regions, Hydrology.
Identifiers: *Kolyma Basin(USSR), *USSR.

Water balance investigations were conducted for eight water-collecting areas in the upper Kolyma basin during 1967-1968. There is a very definite pattern in the change in individual water balance components and the relationship between them in dependence on the nature of the underlying surface and the extent of the water-collecting areas. There is a very distinct role of talus in the water balance as a factor causing an additional influx of moisture in the river balance. From these investigations the need was determined for developing a method for instrumental determination of evaporation and condensation from talus deposits, measurement of moisture reserves in peaty ground, and measurement of evaporation from the soil applicable to the conditions of continuous occurrence of permafrost. (Sims-ISWS)
W76-02926

PECULIARITIES OF FORMATION OF RUNOFF OF THE UPPER KOLYMA BASIN,
For primary bibliographic entry see Field 2C.
W76-02927

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE REAERATION OF UNIFORM STREAMS,
Mississippi Univ., University. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5G.
W76-02934

TRANSIENT FLOW ROUTING IN CHANNEL NETWORKS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 8B.
W76-02941

ON THE VALUE OF INFORMATION TO FLOOD FREQUENCY ANALYSIS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-02952

LOW STREAMFLOW CHARACTERISTICS,
Geological Survey, Reston, Va.
H. C. Riggs.
Meeting Preprint 2533 for presentation at American Society of Civil Engineers National Convention, held in Denver, Colorado, November 3-7, 1975. 13 p, 5 fig, 7 ref.

Descriptors: *Streamflow, *Low flow, *Flow measurement, *Analytical techniques, Flow characteristics, Low-flow frequency, Gaging stations, Recession curves, Base flow, Streamflow forecasting, Methodology, Groundwater, Inflow.
Identifiers: Ungaged sites.

Low streamflows may be characterized by frequency curves of annual or seasonal minimum flows or by the rate of recession of streamflow during periods of fair weather. The discharge at a specified recurrence interval on the frequency curve is commonly used as a low-flow index for planning and design. At an ungaged site estimates of such index discharges are most reliable when based on a few low-flow discharge measurements at the site. Estimates based on drainage area or other basin characteristics are commonly of low reliability. Low-flow frequency characteristics of regulated streams are more difficult to define unless a long record under the same pattern of regulation is available. Another way of characterizing low flows is by the base-flow recession curve which describes the average rate of recession of groundwater discharge to the stream as modified by evapotranspiration and other factors. These curves are useful in short-term low-flow forecasting. Low-flow characteristics of many streams are available from the U.S. Geological Survey, either in published or unpublished form. (Woodard-USGS)
W76-02955

GEOMORPHIC EVIDENCE FOR LATE HOLOCENE TILTING IN SOUTHERN SAN MATEO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-02960

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-02961

THE BLACK HILLS-RAPID CITY FLOOD OF JUNE 9-10, 1972: A DESCRIPTION OF THE STORM AND FLOOD,
National Weather Service, Silver Spring, Md; and Geological Survey, Reston, Va.
F. K. Schwarz, L. A. Hughes, E. M. Hansen, M. S. Petersen, and D. B. Kelly.
Available from Supt. of Documents, GPO, Wash., D.C. 20402 Price $1.55. Geological Survey Professional Paper 877, 1975. 47 p, 29 fig, 7 tab, 14 ref.

Descriptors: *Floods, *Flood data, *Flood damage, *South Dakota, *Runoff, Streamflow, Rainfall-runoff relationships, Hydrologic data, Stream gages, Flow rates, Peak discharge, Cloudbursts.
Identifiers: *Black Hills-Rapid City(SD), *Record flood(SD).

On June 9, 1972, an almost stationary group of thunderstorms formed over the eastern Black Hills of South Dakota near Rapid City and produced record amounts of rainfall and flood discharges. Nearly 15 in. of rain fell in about 6 hours near Nemo, S. Dak., and more than 10 in. of rain fell over a 60 sq mi area. The resulting floods were the highest ever recorded in South Dakota. At least 18 of the 27 streams where peak flows were computed experienced flows that exceeded the 50-year flood. At least 237 people died in the Black Hills flood and 8 people were still listed as missing 6 months after the flood. Another 3,057 people were injured, and total damage is estimated to have exceeded $160 million. Peak discharge determinations were made at 49 sites. Records show that about 13,000 acre-ft of water flowed through Rapid City during the 2 days of flooding. (Woodard-USGS)
W76-02967

2F. Groundwater

A REVIEW OF THE POTENTIAL APPLICATIONS OF REMOTE SENSING TECHNIQUES TO HYDROGEOLOGICAL STUDIES IN AUSTRALIA,
Newcastle Univ. (Australia). Dept. of Physics.
For primary bibliographic entry see Field 7B.
W76-02534

HAMMER SEISMIC TIMING AS A TOOL FOR ARTIFICIAL RECHARGE SITE LOCATION,
Agricultural Research Service, Fresno, Calif. Water Managment Research.
For primary bibliographic entry see Field 4B.
W76-02556

THE STUDY OF GROUND WATER MOVEMENT IN SELECTED AREAS OF NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
F. J. Schulte.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 076, $5.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo. Completion Report, No WI-221-027-74, Dec 1974. 98 p, 31 fig, 9 tab. OWRT A-023-NDAK(2). 14-31-0001-3034, 14-31-0001-3234, 14-31-0001-3534.

Descriptors: *Groundwater movement, *Groundwater potential, *Hydrogeology, Potentiometric level, *North Dakota, *Base flow, *Flow systems.
Identifiers: Pleistocene sediments, Spiritwood Lake(ND), Pierre Shale, Groundwater chemistry.

The Spiritwood Lake study area is in a generally undulating rolling glacial plain 17 miles north and east of Jamestown, North Dakota. Two large valleys can be distinguished in the bedrock surface of the study area. The Pleistocene sediment of the study area was deposited by glacial, fluvial, lacustrine, and eolian processes. There are two types of groundwater-flow systems in the Spiritwood Lake area, local and intermediate. The local groundwater-flow systems are between adjacent topographic highs and lows. The local flow systems are mostly in till and do not affect the level of Spiritwood Lake appreciably. The intermediate groundwater-flow system occurs along the zone of shattered Pierre Shale between the undisturbed Pierre Shale and the overlying glacial drift. Water in the intermediate flow system moves from northeast to southwest. The level of Spiritwood Lake is controlled by discharge from the intermediate groundwater-flow system.
W76-02628

EFFECTS OF GROUNDWATER SEEPAGE ON STREAM REGIMENT,
North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W76-02629

PHYSICAL FRAMEWORK OF GROUND WATER OCCURRENCE AND MOVEMENT IN GLACIAL DEPOSITS IN CENTRAL NORTH DAKOTA,
North Dakota Univ., Grant Forks. Dept. of Geology.
For primary bibliographic entry see Field 7C.
W76-02631

GROUNDWATER SEEPAGE AND ITS EFFECT ON SALINE SOILS,
Montana Environmental Quality Council, Helena.
For primary bibliographic entry see Field 2G.
W76-02639

GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 2. AN EVALUATION OF THERMAL WATER IN THE BRUNEAU-GRAND VIEW AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 4B.
W76-02655

STIMULATION OF GEOTHERMAL AQUIFERS,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-02685

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W76-02714

APPLICATION OF THE SAGAR METHOD FOR THE SOLUTION OF THE INVERSE PROBLEM IN GROUND-WATER HYDROLOGY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. A. Skrivan.
Master of Science Thesis, 1975, 47 p, 1 fig, 15 tab, 12 ref, 1 append.

Descriptors: *Groundwater movement, *Transmissivity, *Model studies, *Equations, *Testing, *Hydrology, Flow, Groundwater, Pumping, Water storage, Hydraulics, Storage coefficient, Recharge, Discharge(Water), Hydrologic data.
Identifiers: *Sagar method, Inverse problem.

The Sagar method treats parameters as unknowns and the partial derivatives in heads as knowns, using spline-function interpolation and a least-squares optimization technique. This method was tested by employing heads generated in a finite-difference model to try to recover the transmissivity distribution used in the model. Storage coefficient and pumping were assumed known. This paper presents tests on three forms of the transient groundwater flow equation in an attempt to understand the method better and make definitive statements about its applicability. In general, results of the study show that transmissivities are recoverable from finite-difference model head

output. Central-difference approximations gave better results than approximations obtained from spline-function interpolation. It is concluded that despite problems with 'surface fitting', the Sagar method should still be applicable in practical situations. Also, assuming the storage coefficient and discharge or recharge per unit area are known will make the inverse problem more tractable. (Mills-Arizona)
W76-02730

THE APPLICATION OF STEP-DRAWDOWN PUMPING TESTS FOR DETERMINING WELL LOSSES IN CONSOLIDATED ROCK AQUIFERS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W76-02747

CHEMISTRY OF EFFERVESCING GROUNDWATER FROM MUNICIPAL WELLS, FLAGSTAFF, ARIZONA,
Northern Arizona Univ., Flagstaff.
For primary bibliographic entry see Field 4B.
W76-02749

CONJUNCTIVE AVAILABILITY OF SURFACE AND GROUND WATER IN THE ALBUQUERQUE AREA, NEW MEXICO: A MODELLING APPROACH,
Maine Univ., Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-02936

COMPARATIVE STUDY OF FRESH-SALT WATER INTERFACES USING FINITE ELEMENT AND SIMPLE APPROACHES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-02940

A DIRECT METHOD FOR THE IDENTIFICATION OF THE PARAMETERS OF DYNAMIC NONHOMOGENEOUS AQUIFERS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
B. Sagar, S. Yakowitz, and L. Duckstein.
Water Resources Research, Vol 11, No 4, p 563-570, August 1975. 3 fig, 1 tab, 31 ref. OWRT C-3259(3708)(6). NSF GK-35915.

Descriptors: *Groundwater, *Anisotropy, *Transmissivity, *Estimating equations, *Model studies, Aquifers, Equations, Numerical analysis, Unsteady flow, Aquifer characteristics, Aquifer systems, Confined water, Optimization, Analytical techniques, Computer models, Mathematical studies.
Identifiers: *Inverse problem, *Parameter identification, *Groundwater modeling, *Nonhomogeneous aquifers.

A method to solve the inverse problem was developed. This method does not require the iterative solution of the aquifer equation, which is an essential characteristic of many current identification schemes. The shape of the surface representing the observed dependent variable (which may be hydraulic head, chemical concentration, or temperature) was approximated from measured samples by means of various interpolation algorithms. Once the various derivatives of the dependent variable are approximated, the identification problem reduces locally to algebraic equations of small dimension. It was shown that aquifer conditions of general heterogeneity and anisotropy were amenable to this method. Input may be treated as an unknown to be evaluated. The method was appraised by application to scattered solution points of a simulated solution to a nonhomogeneous aquifer equation. (Prickett-ISWS)
W76-02943

GROUND WATER FOR IRRIGATION IN THE VIKING BASIN, WEST-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W76-02949

DOCUMENTATION OF FINITE-DIFFERENCE MODEL FOR SIMULATION OF THREE-DIMENSIONAL GROUND-WATER FLOW,
Geological Survey, Reston, Va.
P. C. Trescott.
Open-file report 75-438, September 1975. 32 p, 11 fig, 4 tab, 6 append.

Descriptors: *Computer models, *Groundwater movement, *Saturated flow, *Finite element analysis, Dimensions, Aquifers, Hydrogeology, Simulation analysis, Equations, Methodology, Evaluation.
Identifiers: *Strongly implicit procedure, *FORTRAN IV, Three dimensions.

This report emphasizes the theory of the strongly implicit procedure, instructions for using the groundwater-flow model, and practical considerations for application. It also includes an example simulation. The documentation assumes that the reader is familiar with the physics of groundwater flow, finite-difference methods of solving partial-differential equations and the FORTRAN IV language. The porous medium to be simulated may be heterogeneous and anisotropic and have irregular boundaries. The uppermost hydrologic unit may have a free surface. Stress on the system may be in the form of well discharge (or recharge) and recharge from precipitation. The model permits the use of variable grid spacing and uses the strongly implicit procedure for solution of the simultaneous difference equations. One or more layers of nodes can be used to simulate each hydraulic unit. However, if it is reasonable to assume that storage is negligible in a confining bed and that horizontal components of flow can be neglected, the effects of vertical leakage through a confining bed can be incorporated into the vertical component of the anisotropic hydraulic conductivity of adjacent aquifers. (Woodard-USGS)
W76-02962

GROUND-WATER LEVELS IN WYOMING, 1974,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 7C.
W76-02964

EVALUATION OF THE AQUIFER CHARACTERISTICS OF THE BASALTIC TERRAIN OF MAHARASHTRA IN INDIA,
Central Groundwater Board, Nagpur (India).
P. G. Adyalkar, V. V. Rane, V. V. S. Mani, and J. P. Dias.
Proceedings of the Indian Academy of Sciences, Vol 81A, No. 3, p 108-117, March, 1975. 2 fig, 3 tab, 9 ref.

Descriptors: *Aquifer characteristics, *Permeability, *Hydrogeology, *Aquifer testing, *Climates, Aquifer systems, Aquifers, Groundwater, Rock properties, Water yield, Water table, Water wells, Geologic formations, Basalts, Theims equation, Theis equation, Statistical methods, Rainfall, Water table aquifers, Topography.
Identifiers: Maharashtra(India), Bhima basin, Godavari basin, Wardha basin.

Results are presented of aquifer performance tests on select open wells in Bhima, Godavari and Wardha basins of Maharashtra, piercing the water table zone to a depth of 10 to 15 m in an area of 13,000 sq km. Aquifer parameters, including the coefficient of permeability, of the basaltic water table aquifer in different climatic zones depend upon the rainfall, topography, fillings in the vesicles of the vesicular units and the relative compaction of the rock material. The permeability was computed by Theim's formula and the modified Theis non-equilibrium formula. Statistical analysis of the permeability data of the study basins reveals a decrease in permeability range as one goes from the Bhima basin (low rainfall area) through the Godavari basin (assured rainfall area) to the high rainfall area of Wardha basin. Permeability frequency graphs of the 3 basins indicate different hydrogeological characteristics for each. Negative correlation does exist between the climate and hydrogeological characteristics of these domains. (Robinett-Arizona)
W76-02970

2G. Water In Soils

A REVIEW OF THE POTENTIAL APPLICATIONS OF REMOTE SENSING TECHNIQUES TO HYDROGEOLOGICAL STUDIES IN AUSTRALIA,
Newcastle Univ. (Australia). Dept. of Physics.
For primary bibliographic entry see Field 7B.
W76-02534

UNSATURATED HYDRAULIC CONDUCTIVITY DETERMINATION BY A SCALING TECHNIQUE,
San Paulo Univ. (Brazil). Center for Nuclear Energy in Agriculture.
K. Reichardt, P. L. Libardi, and D. R. Nielsen.
Soil Science, Vol 120, No 3, p 165-168, September 1975. 1 fig, 13 ref.

Descriptors: *Unsaturated flow, *Hydraulic conductivity, *Soil water movement, *Infiltration rates, *Equations, Percolation, Soil moisture, Soil water, Wetting, Moisture content, Nuclear moisture meters, Model studies, Soil moisture meters, Groundwater movement, Permeability, Unsteady flow.
Identifiers: *Wetting front, *Scaling technique, *Tropical soils, *Brazil, Radioactive attenuation.

A scaling technique was presented for estimating the hydraulic conductivity based on experiments of horizontal infiltration of water into an air-dry soil. From plots of the distance from the water source to the wetting front as a function of the square root of time, a scaling factor was obtained that permitted the estimation of the hydraulic conductivity as a function of soil water content. The method was established experimentally using five Brazilian tropical soils and seven California temperate soils, with one of them being taken as a standard soil. Bulk density measurements used to verify the homogeneity of each soil column and volumetric soil water content measurements were made by gamma-attenuation using cesium 137. (Prickett-ISWS)
W76-02558

HEAVY METALS IN WATERS AND SOIL ASSOCIATED WITH SEVERAL PENNSYLVANIA LANDFILLS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5A.
W76-02569

GROUNDWATER SEEPAGE AND ITS EFFECT ON SALINE SOILS,
Montana Environmental Quality Council, Helena.
L. Bahis, and M. R. Miller.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 073, $4.00 in paper copy, $2.25 in microfiche. Research Report No 66, Montana University Joint Water Resources Research Center, Bozeman, October 1975. 39 p, 2 fig, 1 tab, 29 ref. OWRT A-049-MONT(1).

Descriptors: *Saline soils, *Salinity, *Water pollution, *Groundwater, *Montana, *Seepage, Great Plains, Crop production.
Identifiers: *Saline seeps.

Saline seeps are recently developed saline soils in non-irrigated areas that are wet some or all of the time, often with white salt crusts, and where crop or grass production is reduced or eliminated. They are manifestations of 20th century dryland agriculture and the crop-fallow rotation system necessary for moisture conservation and small grain production on the scale practiced in Montana. The widespread occurrence and rapid growth of saline seeps has been recognized as one of the most serious conservation problems in the Northern Great Plains. This report outlines the history of the development of saline deep in Montana and efforts to control it; it describes in detail the hydrogeological setting of the area affected and notes the potential for spreading throughout much of the Northern Great Plains. Environmental aspects and implications of saline seep, including environmental impact and possible control technologies are discussed. (Holje-Montana State)
W76-02639

SULFURIC ACID FOR REDUCING SODIUM HAZARD OF IRRIGATION WATER,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-02666

INFILTRATION CONTROL THROUGH SOIL SURFACE MANAGEMENT,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. M. Dixon.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 543-567, 7 fig, 1 tab, 34 ref, 2 append.

Descriptors: *Infiltration, *Soil surfaces, *Land management, *Hydrostatic pressure, *Permeability, Soil management, Soil physical properties, Cultivated lands, Pore pressure, Equilibrium, Equations, Soil physics, Infiltrometers.
Identifiers: Air-earth interface concept, Effective surface head, Closed-top infiltrometers, Kostiakov's equation.

For most soils, infiltration into a rough, open surface usually exceeds that into a smooth, closed surface by a factor of 10 or more. Infiltration may be controlled over a wide range by designing cultural practices for various levels of surface roughness of openness through suitable tillage or by guiding natural physical and biological processes. This infiltration role, termed 'effective surface head' is defined as the difference between surface water hydrostatic pressure and the soil air back pressure and is expressed as centimeters of water head. In general, water will flow downward displacing the soil air ahead of it when the effective surface head is positive. When it is negative, macropores vent upward the soil air that is being displaced by infiltrating water. When the effective surface head is near zero, static equilibrium is approached. Newly developed closed-top infiltrometers evaluate infiltration responses to natural effective surface heads. A graphing procedure is described which, when used in conjunction with Kostiakov's equation, may be used to predict an infiltration curve. (Mills-Arizona)
W76-02673

SPATIAL VARIABILITY OF WATER RELATED SOIL PHYSICAL PROPERTIES,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
M. A. Coelho.
PhD Dissertation, 1974. 97 p, 17 fig, 17 tab, 49 ref, 3 append.

Descriptors: *Bulk density, *Particle size, *Soil moisture, *Porosity, *Hydraulic conductivity, *Soil analysis, Physical properties, Soil physical properties, Infiltration, Permeability, Soil density, Saturated flow, Soil texture, Soil water movement, Hydrologic properties, Soil classification, Arizona, Statistical methods, Frequency analysis, Sampling, Variability.
Identifiers: *Spatial variation, Pima Clay loam.

The spatial variation of soil parameters is one of the most difficult problems faced withn applying results of localized soil data to large areas, and the inherent variability can be the dominant consideration in determining management practices. This study was performed on an 87 hectare area of Pima Clay loam at the University of Arizona Branch Experiment Station at Marana. The measured parameters showed different patterns of spatial variation (to estimate means within 10% for the 30 cm depth, 5, 51, and 1,011 samples would be required for bulk density, the porosity index, and the saturated hydraulic conductivity, respectively). Values of 15-bar moisture retention corresponding to 500 bulk samples showed a frequency distribution close to the normal with a slight tendency toward skewness. The porosity index showed a nonconsistent distribution pattern at the different depths and a moderately skewed frequency distribution for the composite 180 samples. Close relationships were found between bulk density and percent sand and silt. Particle size distribution exhibited a decrease of silt and clay and a corresponding increase of sand with depth. The porosity index and the saturated hydraulic conductivity tended to increase with depth. Comparison between the sampling scheme used (an unbalanced 3-stage nested design) and 3-stage balanced designs revealed that at least two alternatives would be more effective in decreasing the variance of the mean. (Robinett-Arizona)
W76-02676

PHOSPHORUS SORPTION AND DESORPTION IN CALCAREOUS SOILS FROM ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
L. A. Crisostomo.
Ph.D. Dissertation, 1975. 86 p, 8 fig, 10 tab, 99 ref, 4 append.

Descriptors: *Calcareous soils, *Phosphorus, *Soil chemical properties, *Sorption, Soil types, Calcium compounds, Salts, Acids, Soil management, Fertilizers, *Arizona, Soil-water-plant relationships, Saline soils, Soil physical properties, Agriculture, Acid-base equilibrium, Adsorption, Calcium carbonate.
Identifiers: *Phosphorus sorption isotherm, Sulfuric acid, Avondale soil, Pima soil, Laveen soil, Guest soil, Desorption.

This study examines the applicability of the sorption isotherm procedure in predicting sorption and desorption of P in calcareous soils with and without sulfuric acid amendment. Relationships existing between the P sorption isotherm, yield, and P extracted by sodium bicarbonate and CO2-saturated water were studied. Application of sulfuric acid on four calcareous Arizona soils tended to decrease the soil pH and to increase soluble salts, DTPA extractable iron, NH40Ac extractable aluminum, exchangeable calcium, Al-P fractions, and water soluble P. The adsorption maxima for Avondale, Pima, and Laveen soils were similar (172,167, and 187 micro grams P/g), but that for Guest was much lower (91 micro grams P/g), and was attributed to the low content of calcium carbonate and high content of soluble salts of the Guest soil. When treated with sulfuric acid to neutralize 20 percent acid titratable basicity, all soils tended to desorb P at concentrations of P added for equilibration lower than 5 micro grams/ml (above that value all soils tended to sorb P in amounts higher than the untreated ones, but with a low index of bonding energy). Addition of P and P plus manure tended to shift the isotherms to the right due to an increase of P in equilibrium solution. (Robinett-Arizona)
W76-02677

MANAGEMENT FOR THE CONTROL OF SALTS IN IRRIGATED SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-02679

COMPUTER SIMULATION OF THE SNOWMELT AND SOIL THERMAL REGIME AT BARROW, ALASKA,
Michigan Univ., Ann Arbor. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W76-02703

ACCURACY OF SOIL WATER BUDGETS BASED ON A RANGE OF RELATIONSHIPS FOR THE INFLUENCE OF SOIL WATER AVAILABILITY ON ACTUAL WATER USE,
University of New England, Armidale (Australia). Dept. of Agronomy.
G. G. Johns, and R. C. G. Smith.
Australian Journal of Agricultural Research, Vol 26, No 5, p 871-883, September 1975.

Descriptors: *Soil water, *Estimating, *Agriculture, Hydrologic data, Rainfall, Climate, Evaporation, Measurement, Storage, Equations, Mathematical models, Water utilization.
Identifiers: Available water capacity, Surface zone, Sensitivity analysis, Prediction, Dryland, Computations, Linear function(Linacre), Eagleman function, Shaw function, Johns interactive function, Graphs.

The accuracy of six published functions for deriving dryland water use from evaporative demand and soil water status was assessed by incorporating them in water budgets which were used to estimate dryland soil water status from actual climatic records. Budget-derived estimates were compared with values actually measured under improved pastures in the field over an 842-day period. The root mean square (RMS) of the differences between computed and observed soil water values was used to evaluate the various functions. RMS values were found to vary from 8.1 to 29.5 mm for the functions tested. Soil water estimations made by using a simple ratio function were generally as good as or better than those made by using more complex functions. The sensitivity of the various functions to changes in their input assumptions was tested. The results of these tests will facilitate the selection of the optimum functions for conditions other than those encountered in this study. Reduced accuracy of soil water prediction resulted from the use of functions to set water use equal to the potential rate, regardless of the overall dryness of the soil profile, whenever recent rainfall was calculated to have made water available in the surface zone. (Bell-Cornell)
W76-02715

COMPOSITION AND CONCENTRATION OF SALTS IN SOIL SOLUTIONS OF THE MURGAB OASIS DESERT-MEADOW SOILS UNDER ANCIENT IRRIGATION, (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W76-02732

GROUNDWATER POLLUTION FROM SANITARY LANDFILL LEACHATE, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W76-02733

THUNDERSTORM PRECIPITATION EFFECTS ON THE RAINFALL-EROSION INDEX OF THE UNIVERSAL SOIL LOSS EQUATION,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W76-02740

THE EFFECT OF INCREASING THE ORGANIC CARBON CONTENT OF SEWATE ON NITROGEN, CARBON, AND BACTERIA REMOVAL AND INFILTRATION IN SOIL COLUMNS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W76-02741

VARIABILITY OF INFILTRATION CHARACTERISTICS AND WATER YIELD OF A SEMI ARID CATCHMENT,
Arizona Univ. Tucson. Dept. of Hydrology and Water Resources.
S. Nnaji, T. W. Sammis, and D. D. Evans.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 67-77, 3 fig, 5 tab, 6 ref.

Descriptors: *Infiltration, *Runoff, *Infiltration rates, *Watersheds(Basins), *Arizona, Hydrologic properties, Soil-water-plant relationships, Arid lands, Watershed management, Rainfall, Water yield, Pervious soils.
Identifiers: Silverbell(Ariz).

Space-time variability in the hydrologic characteristics of four major soil series represented in the Silverbell validation site was investigated by sampling the infiltration characteristics, at randomly selected locations, under several vegetative covers within each series. Statistical tests demonstrated that there was not significant difference among the infiltration parameters of all the soil-vegetation combinations. However, the statistically insignificant variations in the parameters produce significant variations in simulated runoff volumes indicating the sensitivity of the runoff generating process to infiltration characteristics of the soils. (McLachlan-Arizona)
W76-02742

FREEZE-THAW EFFECTS ON SOILS TREATED FOR WATER REPELLENCY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2C.
W76-02743

ASSESSING SOIL MOISTURE REMOTELY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato, S. B. Idso, and R. D. Jackson.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 191-198, 4 fig, 12 ref.

Descriptors: *Soil moisture, *Moisture content, *Soil management, *Remote sensing, *Soil moisture meters, Reflectance, Soil surfaces, Microwaves, Soil temperature.

Space-age technology has produced tools which when turned to earthly pursuits can provide information on food and fiber production. Soil moisture has the potential for being remotely assessed, and three techniques for accomplishing this are under study. Two of the methods, reflectance and thermal, are sensitive to the conditions of the bare soil surface. The third technique, microwave emission, appears to have a good potential for assessing soil moisture with depth, because of its greater wavelength. (McLachlan-Arizona)
W76-02753

ASSESSING BARE SOIL EVAPORATION VIA SURFACE TEMPERATURE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2D.
W76-02754

TRITIUM AND DEUTERIUM AS WATER TRACERS IN HYDROLOGIC SYSTEMS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W76-02870

EFFECT OF AN ASPHALT BARRIER ON WATER STORAGE AND DROUGHT PROBABILITY,
Minnesota Univ., St. Paul, Dept. of Soil Science.
For primary bibliographic entry see Field 3B.
W76-02872

NATURE OF WATER-RETAINING FORCES IN MODERATELY WET SOILS OF MEDIUM AND FINE TEXTURE, (IN RUSSIAN),
Agrofizicheskii Mauchno-Issledovateiskii Institut, Leningrad (USSR).
A. M. Globus.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 12: 36-37. Illus. 1974.

Descriptors: Soils, *Podzols, *Chernozems, *Soil-moisture meters, *Moisture content, *Analysis, *Analytical techniques, Soil texture.
Identifiers: Psychrometry, Membrane press method.

Using the membrane press and psychrometric methods, a relationship between the moisture content and chemical potential of water for fine-loamy soddy-podzolic soil and medium-loamy chernozem was determined.--Copyright 1975, Biological Abstracts., Inc.
W76-02900

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Soil Science.
R. H. Rust, and B. H. Gerbig.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 53-62, June 30, 1974. 2 fig, 3 tab, 4 ref. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Aerial photography, *Saline soils, *Minnesota, Photography, Films, Filters, Surveys, Data processing, Costs, Economics, Soils, Salinity, Soil types, Crops, Crop response, Agriculture.
Identifiers: *Red River Valley(Minn).

During this second year of the investigation of the saline soil problem in the Red River Valley, effort was concentrated on a detailed examination of 1:40,000 scale color and color IR photography taken in early August 1973, along the two 10-mile transects in Kittson County. On a portion of one transect, additional imagery was obtained at a scale of 1:10,000. On the basis of the photo interpretation coupled with ground truth observations, it was concluded that about 65% of the landscape is saline-affected. Photo interpretation of fallow areas (about 20% of the areas) cannot be made with any confidence. Cost figures for 35mm imagery were developed. For areas of 25 to 100 square miles, obtaining 35 mm photography seems the most economical and will be used in subsequent imagery and analysis. (See also W76-02901) (Sims-ISWS)
W76-02905

LINEAR DISPERSION IN FINITE COLUMNS,
Connecticut Agricultural Experiment Station, New Haven.
J.-Y. Parlange, and J. L. Starr.
Soil Science Society of America Proceedings, Vol 39, No 5, p 817-819, September-October 1975. 2 fig, 6 ref.

Descriptors: *Dispersion, *Solutes, *Soil water movement, Profiles, Boundary processes, Equations, Mathematical models, Soil moisture, Pore water, Velocity.
Identifiers: *Soil columns, Miscible displacement, Breakthrough curves, Peclet numbers.

The effect of the finite length of a soil column on the miscible displacement of a solute was analyzed. The boundary condtions at both ends of the column affected the breakthrough curve, while only the boundary condition at the entrance of the column affected the profile within the column to any extent. The interaction between boundary conditions and column length was such that while the breakthrough curve is essentially that given by the standard solution for a semi-infinite column, even for relatively short columns, the concentration profile was greatly affected by the finite length of the soil column. (Visocky-ISWS)
W76-02921

SAMPLING SOIL-WATER DISTRIBUTION IN THE SURFACE CENTIMETER OF A FIELD SOIL,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato.
Soil Science, Vol 120, No 4, p 292-294, October 1975. 3 fig, 5 ref.

Descriptors: *Soil moisture, *Soil water, *Evapotranspiration, Soil temperature, Soil analysis, Instrumentation, Sampling, Soil moisture meters, Soil water movement, On-site investigations, Surfaces, Drying.

To delineate the soil-water content in layers as thin as 0.1 cm in the upper centimeter of a field soil, a simple, easily constructed soil sampler was used. Samples were taken every 20 min during one day of soil drying after sprinkling the soil with 0.6 cm of water. The soil in this top centimeter dried fairly uniformly, with the 0- to 0.1-cm layer drying from 0.202 to 0.036 cc/cc in 8 hr. The 0.8- to 1.0-cm layer dried from 0.238 to 0.152 cc/cc in the same period. With the techniques and tools described herein, no difficulty was encountered in distinguishing the soil-water content of one layer from another. (Gibb-ISWS)
W76-02924

HYDRAULIC CONDUCTIVITY CALCULATIONS FOR UNSATURATED STEADY-STATE AND TRANSIENT-STATE FLOW IN SAND,
Florida Univ., Gainesville. Dept. of Soil Science.
A. ELzeftawy, and R. S. Mansell.
Soil Science Society of America Proceedings, Vol 39, No 4, p 599-603 July-August 1975. 5 fig, 2 tab, 25 ref. OWRT A-026-FLA (5).

Descriptors: *Hydraulic conductivity, *Unsaturated flow, *Steady flow, *Unsteady flow, Sands, Moisture content, Soil water movement, Pore pressure, Nuclear moisture meters, Tensiometers, Pressure head, Cores, Laboratory tests, Soil density, Infiltration, Depth, Drainage.
Identifiers: *Suction head.

Using a method employed by Green and Corey (1971), hydraulic conductivity was calculated as a

function of water content for Lakeland fine sand. A gamma ray transmission method for measuring soil water content and a tensiometer-pressure transducer arrangement for measuring soil water suction were also used to experientally determine values of hydraulic conductivity for a similar range of soil water contents in undisturbed soil cores and hand-packed soil columns. Measured and calculated values were in good agreement for steady flow. During transient flow soil water content was observed to be a non-unique function of suction for water desorption, but depended upon the state of flow. Higher water contents were found at a given pressure head during unsteady flow than during steady flow or static equilibrium (zero flow). Graphs of water content versus soil water suction were similar for cases of steady and no-flow conditions. For transient flow, the soil-water pressure depended upon the soil-water content and rate of change of pressure head with time. (Visocky-ISWS)
W76-02932

A FIELD STUDY OF SOIL WATER DEPLETION PATTERNS IN PRESENCE OF GROWING SOYBEAN ROOTS: I. DETERMINATION OF HYDRAULIC PROPERTIES OF THE SOIL,
Minnesota Agricultural Experiment Station, St. Paul.
L. M. Arya, D. A. Farrell, and G. R. Blake.
Soil Science Society of America Proceedings, Vol 39, No 3, p 424-430, May-June 1975. 8 fig, 3 tab, 18 ref. OWRT B-015-MINN (10).

Descriptors: *Hydraulic properties, *Soil water, *Soil properties, Soil moisture, On-site investigations, Laboratory tests, Hydraulic conductivity, Diffusivity, Soils, Soil mechanics, Soil physics, Soil water movement, Agronomy, Water pressure, Soil temperature.
Identifiers: Soil water content, Soil water pressure.

The hydraulic properties of a Waukegan loam profile were determined by field and laboratory procedures. Relationships between pressure and water content obtained in the laboratory were found to be variable at pressures above -100 cm of water. In this range field data were considered more reliable. Hydraulic conductivity in the field was determined from flux and hydraulic-head gradient data. Hydraulic-head gradients were obtained from tensiometric measuremets of pressure at various depths. In the soil profile that was subject to both evaporation and drainage, the position of a downward moving 'zero flux' boundary was determined. Flux across any depth was obtained by integrating the rate of change of water content with time between the 'zero flux' boundary and the depth in question. A modified laboratory technique was used to determine the diffusivity of undisturbed soil cores. Water content vs. distance data were obtained subject to the conditions that evaporation was proportional to the square root of time and the soil core was effectively semi-infinite. A diffusivity equation was used to calculate diffusivity from the water content-distance functions. Diffusivities were converted to conductivities. The 'zero flux' boundary technique greatly reduced the time needed by covered plot methods to obtain conductivities at high soil-water pressures. The laboratory procedure required only about 30 min/sample and gave results that compared favorably to field results. At high water contents and to a depth of 20 cm, field conductivites were slightly lower than laboratory estimates. Below the 20-cm depth, field data tended to be slightly higher. (Sims-ISWS)
W76-02933

PREDICTION OF IMBIBITION IN A HORIZONTAL COLUMN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux, and J. Khanji.
Soil Science Society of America Proceedings, Vol 39, No 4, p 613-617, July-August 1975. 7 fig, 13 ref. OWRT B-070-COLO (14). 14-31-0001-3566.

Descriptors: *Soil water movement, *Air, *Diffusivity, *Equations, Approximation method, Unsaturated flow, Porosity, Porous media, Velocity, Soil moisture, Pore pressure, Permeability, Viscosity, Hydraulic conductivity, Model studies, Laboratory tests, Graphical analysis, Numerical analysis.
Identifiers: *Imbibition, Soil columns, Relative permeability.

An approximate analytical solution to the equations of water and air movement in a horizontal porous medium was presented. From the solution for the water content profile, imbibition rates could be predicted as a function of time. A comparison of predicted and experimental imbibition rates showed an excellent agreement. This result is particularly significant because no numerical integration of a differential equation was necessary to obtain the water content profiles and to obtain the imbibition rates. The method of solution required only graphical constructions and integrations of curves simply related to the basic soil characteristics such as capillary head and unsaturated hydraulic conductivity. (Visocky-ISWS)
W76-02935

SOIL MOSITURE DETECTION DEVICE,
W. G. Lohoff.
U.S. Patent No 3,916, 678, 5 p, 11 fig, 1 ref; Official Gazete of the United States Patent ent Office, Vol 940, No 1, p 96, November 4, 1975.

Descriptors: *Patents, *Soil moisture, *Mointure content, *Soil moisture meters, Soil water, Soil physical properties, Porosity, Soil-Water-Plant relationships.

A soil moisture sensor is described which is responsive to the moisture content of the soil in which the plant is growing and which is a direct indication of the plant's sufficiency or need for water. The apparatus includes a prous sensing element that is inserted into the soil and responds to the moisture content of the soil to control a visual indicator of the soil condition. The porous element constitutes an air valve. When the soil is relatively dry, air flows through the porous element to break a small vacuum which activates the indicator. When the soil is wet, air cannot pass through the sensing element and the indicator is not activated. (Sinha-OEIS)
W76-02997

2H. Lakes

ZOOPLANKTON PRODUCTION IN LAKE ONTARIO AS INFLUENCED BY ENVIRONMENTAL PERTURBATIONS,
State Univ. of New York at Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-02502

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 10. VEGETATION OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ., Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W76-02560

EQUILIBRIUM ADSORPTION OF INORGANIC PHOSPHATE BY LAKE SEDIMENTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5C.
W76-02562

MANAGEMENT OF THE BIOLOGICAL RESOURCES OF THE LAKE ONTARIO BASIN,
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W76-02617

CONFERENCE ON THE MANAGEMENT OF RECREATIONAL LAKES.
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 6B.
W76-02641

A LAKE--HOW DOES IT BEHAVE,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-02644

UPGRADING LAKES--LAKE RENEWAL AND MANAGEMENT TECHNIQUES,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
For primary bibliographic entry see Field 5G.
W76-02645

ALTERNATIVES TO PROTECT AND ENHANCE LAKES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-02648

AN ENVIRONMENTAL LAND PLANNING APPROACH--CASE STUDY, LILY LAKE PROJECT,
Wisconsin Univ., Madison. Environmental Awareness Center.
For primary bibliographic entry see Field 6B.
W76-02649

THE FACTS OF LIFE,
Wisconsin Univ. Center System-Marinette County, Bay Shore. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-02651

LAKES AND WISCONSIN'S FUTURE,
Wisconsin Office of the Governor, Madison. Lieutenent Governor.
For primary bibliographic entry see Field 6E.
W76-02652

CYPRINODON TULAROSA, A NEW CYPRINODONTID FISH FROM THE TULAROSA BASIN, NEW MEXICO,
Michigan Univ., Ann Arbor. Museum of Zoology.
R. R. Miller, and A. A. Echelle.
Southwestern Naturalist, Vol 19, No. 4, p 365-377, January 20, 1975. 3 fig, 4 tab, 24 ref.

Descriptors: *Killifishes, *Freshwater fish, *Fish genetics, *Fish taxonomy, *Lake morphology, Fish, Aquatic animals, *New Mexico, Rio Grande River, Pleistocene Epoch, Geologic time, Geomorphology, Biology, Arid lands, Lake basins, Hydrography.
Identifiers: *Cyprinodon tularosa, White Sands pupfish, Tularosa basin(New Mex.), Lake Otero, Rio Grande Basin, Meristic characters Morphometric characters.

The White Sands pupfish, Cyprinodon tularosa, is described from the Tularosa basin of southern New Mexico (the Pleistocene Lake Otero). Species of Cyprinodon are characteristic inhabitants of isolated waters of the North American desert and have deomostrated their ability to adapt to extreme environments that are often intolerable to other fish life. The presence of this fish in some of

the remnant springs and creeks of the Tularosa basin supports the view that there was a pre-Wisconsin hydrographic connection to the south with what is now the Rio Grande basin. The new species, which is a member of the Cyprinodon variegatus complex, is evidently closest to C. bovinus of western Texas, from which it differs in certain meristic and morphometric characters (such as smaller scales, fewer pelvic rays, and more gill rakers), female color pattern, and in the breeding colors of the male. It is believed that both species may have arisen from a C. variegatus-like stock that invaded the Rio Grande or a precursor stream and lake system during Pleistocent time. (Robinett-Arizona)
W76-02668

STATUS MEMORANDUM ON CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02682

ANALYSIS OF THREE YEARS OF COMPLETE-FIELD TEMPERATURE DATA FROM DIFFERENT SITES OF HEATED SURFACE DISCHARGES INTO LAKE MICHIGAN,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-02683

STRATIFIED LAKE AND OCEANIC BRINES: SALT MOVEMENT AND TIME LIMITS OF EXISTENCE,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W76-02696

LAKE CLASSIFICATION--A TROPHIC CHARACTERIZATION OF WISCONSIN LAKES,
Wisconsin Univ., Madison. Water Resources Center.
P. D. Uttormark, and J. P. Wall.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 177, $6.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-75-033, June 1975. 165 p, 8 fig, 13 tab, 22 ref, 3 append. EPA 1BA031. R-801363.

Descriptors: *Lakes, *Trophic level, *Classification, Water quality, Secchi disks, Dissolved oxygen, Fishkill, *Wisconsin.
Identifiers: *Lake condition index, *Lake classification, *Trophic characterization.

The design and application of the Lake Condition Index (LCI) system of classifying lakes are described, and it is demonstrated that lake classification can be employed as a useful tool by resource managers for comparing the trophic condition of large numbers of lakes. The LCI system was generated when an evaluation of other systems revealed that most are presently unsuitable for classifying the vast majority of lakes because the analytical data required for their use are lacking. Utilizing subjective information, the LCI system was applied to the classification of more than 1100 large Wisconsin lakes. Checks of the results show that 86% of the lakes were appropriately classified within the limits of the system; 14% were misclassified, as judged by individuals familiar with the lakes in question. Most, but not all, discrepancies were due to erroneous input data. The LCI values obtained were coupled with nutrient-loading considerations and shoreline density-development factors to demonstrate that lake classification can serve as a workable data base for lake renewal and management programs. The LCI system is easily modified to incorporate additional data for special purposes. The system could be used to classify an estimated 70-80% of the larger lakes in the United States. (EPA)
W76-02764

THE INFLUENCE OF FOOD SUPPLY ON THE MIGRATION PATTERN OF THE TEAL (ANAS CRECCA), (IN GERMAN),
Zoologische Staatssammulung, Munich (West Germany).
J. Reichhoff.
Egretta. 17(1): 4-14. Illus. 1974.

Descriptors: *Common teal, Migration patterns, Migratory birds, Seasonal, Reservoirs, Wetlands, *Food abundance, Food chains.
Identifiers: West Germany, Lake Neusiedl, Lake Constance.

The reservoirs on the lower Inn River in the northern foreland of the Alps between Lake Neusiedl and Lake Constance (West Germany) are the most important wetlands for the passage of teal. In Autum their numbers can reach nearly 5000 individuals. The basis for thic concentration is an abundant food supply in the shallow water zones of the reservoirs. These shallows have been formed in the process of silting of the reservoirs over the past decade. The development of teal stock has closely followed this process. Teal utilize the food supply during autumn in the water of 0-15 cm depth so intensively that a food shortage occurs and the birds are forced to move away before ice formation sets in. Thus, the pattern of migration is strongly influenced by the food supply and the density of teal. The possibility should be taken into account when patterns of migration of this especially adaptable duck species, are evaluated.--Copyright 1975, Biological Abstracts, Inc.
W76-02884

DISTRIBUTION OF MERCURY, CADMIUM, LEAD AND THALLIUM IN A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W76-02898

REMOTE SENSING APPLICATIONS TO HYDROLOGY IN MINNESOTA,
Minnesota Univ., Minneapolis, Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-02907

REMOTE SENSING IN LAKE SUPERIOR STUDIES,
Minnesota Univ., Duluth. Dept. of Physics.
M. Sydor.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 197-240, June 30, 1974. 3 append. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Lake Superior, *Turbidity, *Water quality, Satellites(Artificial), Dissolved solids, Sediment discharge, Erosion, Water pollution sources, Harbors, Dredging, Currents(Water), Great Lakes, Sediments, Sedimentology.
Identifiers: *ERTS.

Correlation of ERTS data with measurements of turbidity and transmittance for water in the Duluth-Superior harbor and the adjacent Lake Superior water was used in production of turbidity maps for the extreme western arem of Lake Superior. Comparison of reflectance of water obtained from ERTS Bands 4, 5, and 6 as a function of suspended solids indicated the possibility of using this data in effluent tracing. Correlation of ground truth with satellite data allowed for extension of results obtained from measurements at few key stations to a large area of the lake. The suspended solids for surface waters of Lake Superior can be measured with better than 20% accuracy. Limitations on the accuracy of the remote sensing measurements establish the lower threshold of detectability of suspended load at 8 mg/1, for the Superior Bay. The three appendixes contain reports detailing the results of these studies. (See also W76-02901) (Sims-ISWS)
W76-02908

REPORT ON INVESTIGATION OF WATER QUALITY OF CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02931

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2J.
W76-02963

SOME LIMNOLOGICAL ASPECTS OF 20 SELECTED LAKES IN EAGAN AND APPLE VALLEY, MINNESOTA,
Geological Survey, St. Paul, Minn.
M. R. Have.
Open-file report 75-528, 1975. 44 p, 7 fig, 24 tab, 13 ref, append.

Descriptors: *Limnology, *Lakes, *Water quality, *Environmental effects, *Minnesota, Urbanization, Data collections, Chemical properties, Biological properties, Physical properties, Sampling, Chemical analysis, Water temperature.
Identifiers: *Eagan(Minn), *Apple Valley(Minn).

Selected physical, chemical, and biological parameters were determined to assess the quality of 20 lakes in the cities of Eagan and Apple Valley, Minn. The lake are eutrophic except Holland and Fish Lakes, which are mesotrophic. Since the late 1950's the communities of Eagan and Apple Valley have undergone suburban growth. Changes in land use and increases in storm-sewer and septic-tank effluents in and around lakes can have a decided effect on nutrient loadings in lakes, resulting in accelerated eutrophication. The lakes with storm sewer inlets show no evidence of being different in quality than the lakes without storm sewer inlets. This may result from all lakes being subjected to overland runoff from the hilly terrain. Hence, it probably makes little difference, as far as nutrient enrichment is concerned, whether the overland runoff enters the lakes directly or through a storm sewer. There are no apparent trends in the data available concerning the quality of the lakes. Data collected from October 1972 to October 1974 are presented. (Woodard-USGS)
W76-02966

MACROFAUNA OF THE STONY BOTTOM OF LAKE GENEVA, (IN FRENCH),
For primary bibliographic entry see Field 5C.
W76-02985

THE PELAGIC ROTATORIA OF THE SEMPACHERSEE WITH SPECIAL REGARD TO THE BRACHIONIDAE AND THE QUESTION OF NUTRITION, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W76-02993

POPULATION STRUCTURE OF THE DOMINATING BENTHIC ORGANISMS OF LAKE DUSIA: 1. POTAMOTHRIX HAM-

MONIENSIS MICH. IN 1969-1971, (IN RUSSIAN),
Akademiya Nauk Litovssoi SSR, Vilnius. Institut Zoologii i Parazitologii.
A. I. Grigyalis.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai. 4. 77-84, Illus. 1974. (Lith. and Engl. summ.).

Descriptors: *Benthos, Lakes, *Worms, Invertebrates, *Productivity.
Identifiers: *Potamothrix-Hammoniensis, *USSR(Lake Dusia), Dominating species.

In 1966-1971 P. hammoniensis was a dominating species in the zoobenthos of the lake. Three size-groups of species were distinguished: young worms 0.6-1.5 mg weight; immature worms 1.6-3.7 mg weight; sexually mature worms (with clitellum) 3.8-7.0 mg weight. These size-groups occurred throughout the year. The lowest productivity (0.33 g/m2) was in 1967 and the highest (10.74 g/m2) in 1969. Average productivity was 5.32 g/m2.--Copyright 1975, Biological Abstracts, Inc.
W76-02994

2I. Water In Plants

EFFECTS OF RAINFALL AND TEMPERATURE ON THE DISTRIBUTION AND BEHAVIOR OF LARREA TRIDENTATA (CREOSOTE-BUSH) IN THE MOJAVE DESERT OF NEVADA,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
J. C. Beatley.
Ecology, Vol 55, No 2, p 245-261, Early Spring, 1974. 9 fig, 1 tab, 21 ref.

Descriptors: *Rainfall, *Air temperature, *Spatial distribution, *Limiting factors, *Arid lands, Plant physiology, Ecology, *Nevada, Desert plants, Moisture availability, Plant growth, Plant populations, Ecological distribution, Water requirements, Arid climates, Germination, Rainfall disposition.
Identifiers: *Larrea tridenta(Creosote-bush), Mojave desert, Plant density, Nevada Test Site.

The investigations were done at 39 sites with Larrea and 20 sites without Larrea in 8 drainage basins at elevations of 915-1,770 m over a 2,600 sq km area of the Nevada Test Site. Percentage of cover by Larrea follows two patterns of relationship with rainfall: (1) where mean rainfall is low to intermediate, cover is highly correlated with mean annual rainfall and less correlated with elevation, and (2) on sites with high mean rainfall there is a consistently low density of Larrea. In general, in undisturbed communities, the taller the Larrea plants the fewer there are of them. Tall plants (greater than 1m) occur in low density and on sites with high rainfall (mean 160-183 mm). Average extreme minimum air temperatures on all Larrea sites were above 1F and the absolute minimum was -8F. There is no pattern of relationship between maximum temperatures and the distribution of Larrea. Altitudinal and latitudinal limits of Larrea coincide with a maximum mean rainfall of 183 mm, and mean annual rainfall of 160-183 mm appears to be critical to the plant's behavior. Highest germination occurred with 80-150 mm of seasonal rain, and either lower or higher seasonal rainfalls resulted in lower percentages of germinable seeds. (Robinett-Arizona)
W76-02524

CLIMATES AND VEGETATION PATTERN ACROSS THE MOJAVE/GREAT BASIN DESERT TRANSITION OF SOUTHERN NEVADA,
Cincinnati Univ., Ohio. Dept. of Biological Sciences.
J. C. Beatley.
American Midland Naturalist, Vol 93, No 1, p 53-70, January 1975, 5 fig, 4 tab, 20 ref.

Descriptors: *Desert plants, *Semiarid climates, *Deserts, *Climatic zones, *Air circulation, Vegetation, Climates, Arid climates, Climatology, Plant growth, Plant physiology, *Nevada, Soil-water-plant relationships, Environmental effects, Elevation, Sagebrush, Plant populations, Rainfall, Air temperature, Soil environment, Temporal distribution, Moisture availability, Soil moisture.
Identifiers: Larrea tridentata, Artemisia tridentata, Atriplex confertifolia, Mojave Desert, Great Basin Desert, Vegetation pattern.

The area of transition from the Larrea (creosote bush) vegetation of the Mojave Desert in southern Nevada to the Artemisia (sagebrush) and Atriplex (shadscale) of the Great Basin Desert of central Nevada is described. Causes of climatic patterns in this region and the relationship of these patterns to the vegetation and its pattern across the transition are examined. Plant communities of this transition zone are under primary control of climatic variables. Rainfall increases and temperature decreases as the elevation of the drainage basins increases from south to north. Minimum temperature and maximum rainfall tolerances of Mojave Desert Larrea communities are exceeded across the area of transition as, apparently, are the mean maximum temperature and minimum rainfall tolerances of the Great Basin Artemisia communities. Only Atriplex confertifolia communities cannot be so defined as they occur along topographic gradients in both Mojave and Great Basin Desert climates. Within the basins, the climates and vegetation pattern are primarily under the control of patterns of air circulation and nocturnal cold air accumulations, and secondarily under control of edaphic (soil) factors. (Robinett-Arizona)
W76-02525

PRODUCTIVITY AND FLOWERING OF WINTER EPHEMERALS IN RELATION TO SONORAN DESERT SHRUBS,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
W. L. Halvorson, and D. T. Patten.
American Midland Naturalist, Vol 93, No 2, p 311-319, April 1975, 5 tab, 30 ref.

Descriptors: *Plant physiology, *Plant growth, *Semiarid climates, *Desert plants, *Shrubs, Deserts, *Arizona, Germination, Growth stages, Soil-water-plant relationships, Phenology, Soil moisture, Environmental effects, Flowering, Ecology, Vegetation, Vegetation establishment, Canopy, Elevation, Productivity, Biomass, Biomes, Temporal distribution.
Identifiers: *Sonoran Desert, Cave Creek(Ariz), Winter ephemerals, Sonoran Desert shrubs, Vegetation density.

The Sonoran Desert of North America is characterized by a hot, dry climate, with small mountain ranges and a vegetation of shrubs, small trees, cacti and associated ephemerals. This study attempts to related ephemeral productivity and density to varying densities of shrubs on a Sonoran Desert hill near Cave Creek which lies north of the Salt River in central Arizona. Higher shrub density associated with increased elevation appears to decrease both ephemeral biomass productivity and density, while ephemeral growth is enhanced under a shrub canopy if it is not too dense or low-hanging. Phenology of ephemerals on the desert study site shows early coolseason germination when the soil moisture is relatively high, low tolerance to heat, and early flowering when compared to shrubs and succulents in the same area. (Robinett-Arizona)
W76-02526

THE EFFECT OF DECREASING WATER POTENTIAL ON NET CO2 EXCHANGE OF INTACT DESERT SHRUBS,
Duke Univ., Durham, N.C. Dept. of Botany.
W. R. Odening, B. R. Strain, and W. C. Oechel.
Ecology, Vol 55, No 5, p 1086-1095, Late Summer, 1974. 5 fig, 30 ref.

Descriptors: *Desert plants, *Photosynthesis, *Drought tolerance, *Carbon cycle, *Environmental effects, Plant physiology, Drought resistance, Water requirements, Plant tissues, Phreatophytes, Xerophytes, Transpiration, Temperature control, Climates, Adaptation, Precipitation(Atmospheric), Carbon dioxide.
Identifiers: Water potential, *Net CO2 exchange, Larrea divaricata Cav., Encelia farinosa Gray, Chilopsis linearis Cav.

This study compares the effects of seasonal (in situ) and experimentally-induced drought on three desert shrubs of different growth types: Larrea divaricata Cav., Encelia farinosa Gray, and Chilopsis linearis Cav. Field measurements of water potential and photosynthesis were obtained, and additional experiments were conducted in a transplant garden and under controlled environments in a phytotron. All three species have adapted to the extreme desert conditions in diverse ways which allow maintaining a positive accumulation of carbon dioxide for the longest possible period. Larrea has high protoplasmic tolerance to drought stress and is able to maintain net photosynthesis through long periods of low water potential. Photosynthesis activity in Encelia is prolonged, and water loss reduced, by seasonal and drought-induced leaf variability. Chilopsis is most affected by decreasing water potentials, but xeromorphic leaf tissue augments the phreatophytic habit in maintaining relatively high water potential. A transpiration-retarding mechanism is also hypothesized. (Mills-Arizona)
W76-02529

COMPARATIVE PHOTOSYNTHETIC AND RESPIRATORY GAS EXCHANGE CHARACTERISTICS OF ATRIPLEX LENTIFORMIS (TORR.) WATS. IN COASTAL AND DESERT HABITATS,
State Univ. of New York at Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2D.
W76-02530

QUANTITATIVE STUDIES OF ROOTS OF PERENNIAL PLANTS IN THE MOJAVE DESERT,
California Univ., Los Angeles. Lab of Nuclear Medicine and Radiation Biology.
A. Wallace, S. A. Bamberg, and J. W. Cha.
Ecology, Vol 55, No 5, p 1160-1162, Late Summer, 1974, 2 tab, 8 ref.

Descriptors: *Soil moisture, *Arid lands, *Desert plants, *Root systems, *Biomass, Plant physiology, Plant growth, Root zone, Soil-water-plant relationships, Root development, Moisture availability, Plant tissues, Rain water, *Nevada, Plant pathology, Microenvironment, Deserts, Southwest U.S.
Identifiers: *Mojave Desert, Perennial plants, Rock Valley(Nevada Test Site), Stem biomass, Root biomass.

Studies of rooting habits of desert plants in the western U.S. have shown that the plants generally are not deeply rooted except where rain water accumulates. Root and stem weights were obtained for 10 species of perennial plants in the Rock Valley area of the Nevada Test Site in order to develop methods for determining below-ground biomass under given conditions. High correlation was shown between root and stem weights, with root weight for the total of all plants considered equal to about 45 percent of the sum of stem and root weights. Variations in the root-stem ratio could be due to differential water availability in the microterrain, pruning from wind action and animals, dieback of stems or roots, age of plants, and a host of other factors. The proportion that was root was generally independent of plant size, but there were species differences. For some species, root biomass can be estimated from stem weights for a population within a possible error of

plus or minus 10 to 20 percent. The data were combined with stem weights by dimension analysis to calculate the below-ground biomass per hectare in the study area. Approximately 1618 kilograms per hectare of roots were present in Rock Valley together with 1520 kilograms per hectare stem biomass. (Robinett-Arizona)
W76-02531

VEGETATION OF THE SANTA CATALINA MOUNTAINS, ARIZONA. V. BIOMASS, PRODUCTION AND DIVERSITY ALONG THE ELEVATION GRADIENT,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Ecology and Systematics Section.
R. H. Whittaker, and W. A. Niering.
Ecology, Vol 56, No 4, p 771-790, Summer, 1975. 9 fig, 4 tab, 83 ref.

Descriptors: *Desert plants, *Mountain forests, *Elevation, *Vegetation, *Biomass, *Productivity, *Arizona, Mountains, Slopes, Topography, Forests, Plant physiology, Plant growth, Semiarid climates, Soil moisture, Deserts, Moisture availability, Climatic zones, Soil-water-plant relationships, Grasslands, Subhumid climates, Humid climates, Precipitation(Atmospheric), Arid climates, Biomes, Ecology, Plant populations, Temporal distribution.
Identifiers: *Santa Catalina Mountains(Ariz), Diversity, Woodland.

The study was done on the south slope of the Santa Catalina Mountains, located to the northeast of Tucson, Arizona, which bears an uninterrupted vegetational gradient from subalpine forest through woodlands and grasslands to desert. For the elevation gradient, the relation of diversity to moisture is combined with the relation to temperature, from which increasing diversity toward lower elevations would be expected. Aboveground biomass together with aboveground primary productivity decreaseu along the elevation gradient from high-elevation forests to desert grassland and deserts. Biomass and production show a two-slope relation to elevation and probably to precipitation, with a greater decrease from the high-elevation forests to the mid-elevation woodlands and a less steep decrease from dry woodlands through desert grassland into desert. Arid environment communities are surface-limiting, with transpiring surfaces minimized but with high productive efficiency of those surfaces made possible by their exposure to relatively full sunlight. The forests of the more humid environments are surface-abundant; with sufficient moisture they have much higher leaf area indices, but productive efficiency is lower. Vascular plant species diversity decreases from high-elevation fir forests to pine forests, increases from pine to the open woodlands, and decreases from dry woodlands through the desert grassland and mountain slope desert to the lower bajada (creosotebush) desert. (Robinett-Arizona)
W76-02532

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 10. VEGETATION OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ., Milwaukee. Dept. of Botany.
F. Stearns, and N. Kobriger.
Argonne National Laboratory Report ANL/ES-40, Vol 10, April 1975. 113 p, 11 fig, 5 tab, 157 ref, 2 append.

Descriptors: *Lake basins, *Lake Michigan, *Vegetation, Watersheds(Basins), Forests, Trees, Herbivores, Plant groupings, Revegetation, Vegetation establishment, Vegetation regrowth, Lakes, Wetlands, Forest fires.
Identifiers: *Plant succession.

The presettlement vegetation of the Lake Michigan basin consisted primarily of conifer, hardwood and mixed forests with savanna grassland, shrub, dune, and sedge communities in the wet or dry areas, reflecting the influences of postglacial climate, soil, and disturbance. Settlers disturbed the vegetation by draining wetlands and cutting the forests; extensive fires often followed the logging. By 1920 most of the northern part of the basin had been logged. Crops and second-growth timber have replaced the plants lost to the plow and ax. Northern counties are now reoccupied by northern mesic and xeric forest and aspen-birch stands. With some exceptions, agriculture is confined to the southern half of the Basin, wherein agricultural crops are the dominant plant communities. Along the easter shores in Michigan and in Door County, Wisconsin, the moderating influence of Lake Michigan permits extensive fruit production. The concept of plant succession and several routes by which it may proceed were described, particularly primary succession on dunes and wetlands, and secondary succession on logged or burned forest land, and old fields. (See also W74-09407, W74-13169 and W74-1312) (Sims-ISWS)1)
W76-02560

SUBTROPICAL FRESHWATER SHRIMP MACROBRACHIUM NIPPONENSE (DE HAAN) (PALAEMONIDAE) IN PONDS NEAR MOSCOW, (IN RUSSIAN),
Akademiya Nauk SSSR, Leninggrad. Zoologicheskii Institut.
B. G. Ivanov, and Ya. I. Starobogatov.
Ekologiya. 5(6): 83-85. Illus. 1974.

Descriptors: *Ponds, Subtropic, *Shrimp, *Stocking.
Identifiers: Macrobrachium-Nipponense, Moscow, Palaemonidae, *USSR, Freshwater shrimp.

In the 1960's Moscow aquarists were carthing unique freshwater shrimp in the cooling ponds of a state regional electric power plant. The shrimp was identified as the subtropical species M. nipponense. The shrimp were imported into the Moscow region (Russian SFSR, USSR) in 1960 along with the juveniles of herbivorous fishes (white amur and silver carp) from the Yangtze River (China). The successful introduction of the subtropical shrimp in Moscow waters is explained by the fact that the water temperature in the cooling ponds of the station is generally 10 deg. higher than in ordinary water bodies of the same latitude.--Copyright 1975, Biological Abstracts, Inc.
W76-02590

FEEDING OF TWO FROG SPECIES IN FISHERY PONDS OF THE MORDOVIAN ASSR, (IN RUSSIAN),
Mordovia State Univ., Saransk (USSR).
A. I. Dushin.
Ekologiya. 5(6): 87-90. 1974.

Descriptors: *Frogs, Fisheries, Carp, Fish, Insects, Algae, Mollusks.
Identifiers: Beetle, *Cannibalism, *Feeding, *Lake frogs, Mordovian-ASSR, Rana-Escultenta, Rana-Ridibunda, *USSR.

Data are presented on the feeding of the lake frog Rana ridibunda and edible frog R. esculenta and their tadpoles in carp rearing ponds (Russian SFSR, USSR). Fry of carp and trash fish accounted for about 2% by weight of the food of the frogs. Other components were beetles, insect larvae, tadpoles and young frogs, higher plants, algae and mollusks. Cannilbalism was widespread in the lake frog (45% of the specimens examined).--Copyright 1975, Biological Abstracts, Inc.
W76-02600

VEGETATION RESPONSES TO GRAZING, RAINFALL, SITE CONDITION, AND MESQUITE CONTROL ON SEMIDESERT RANGE,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
D. R. Cable, and S. C. Martin.
US Department of Agriculture Forest Service Research Paper RM-149, July, 1975. 25 p, 17 fig, 6 tab, 11 ref.

Descriptors: *Vegetation establishment, *Rainfall, *Range management, *Mesquite, *Semiarid climates, *Grazing, Vegetation effects, Infiltration, Sheet erosion, Soil surfaces, Vegetation, Grasslands, Erosion control, Crop production, *Arizona, Ranges, Desert plants, Carrying capacity, Grasses, Competition, Productivity.
Identifiers: *Mesquite control, Santa Rita Experimental Range(Ariz), Annual grass, Perennial grass.

A discussion is presented of changes in vegetation during a 10-year period (1957-1966) on semidesert rangelands on the Santa Rita Experimental Range near Tucson, Arizona, as affected by climatic factors, cattle grazing, and the control of velvet mesquite. With an annual average rainfall of 17 inches, average perennial grass production for the study period varied from 352 to 524 pounds/acre. Annual grass production fluctuated much more than perennial grass production, varying from essentially none in 1962, the driest year, to 425 pounds/acre in 1959. The 3 major factors affecting annual grass production included rainfall, mesquite competition, and perennial grass competition. Data indicate little change in mesquite cover during the study period. Mesquite comprised 32 and 38 percent of total three-shrub crown intercept on mesquite-alive pastures, but less than 2 percent on the mesquite-killed pastures. Mesquite control was beneficial in increasing perennial grass cover, thus reducing runoff and sheet erosion. (Robinett-Arizona)
W76-02663

DISTRIBUTION OF FISHES IN THE DOLORES AND YAMPA RIVER SYSTEMS OF THE UPPER COLORADO BASIN,
Utah Cooperative Fishery Unit, Logan.
P. B. Holden, and C. B. Stalnkaker.
Southwestern Naturalist, Vol 19, No. 4, p 403-412, January 20, 1975. 4 fig, 3 tab, 7 ref.

Descriptors: *Freshwater fish, *Colorado River Basin, *Fish reproduction, *Streams, Colorado, Colorado River, Fish, Aquatic animals, Fish conservation, Fish populations, Fish barriers.
Identifiers: Dolores River, Yampa River, *Colorado squawfish(Ptychocheilus lucius), Humpback chub(Gila cypha), Bonytail chub(Gila elegans), Humpback sucker(Xyrauchen texanus), Rare and endangered species.

Fish sampling in Colorado was conducted in the Dolores River in 1971 and the Yampa River system in 1968-71, with emphasis placed on rare and endangered species. Of the eleven species found in the Dolores River, no rare or endangered forms were noted. Twenty-two species collected in the Yampa River system included four rare and endangered forms: Colorado squawfish (Ptychocheilus lucius), humpback chub (Gila cypha), bonytail chub (Gila elegans) and humpback sucker (Xyrauchen texanus). The authors conclude that the Dolores River systems appears to have little importance from the standpoint of preservation of rare and endangered fish species, whereas the Yampa River is very important to the preservation of these fish in the Colorado basin, primarily because all of these rare forms are at least present in small numbers and some are apparently reproducing. In particular, the Yampa system appeared important to reproduction and preservation of Colorado squawfish. (Robinett-Arizona)
W76-02667

AQUATIC VEGETATION OF THE USSR, (IN RUSSIAN),
I. D. Bogdanovskaya-Gienef.
Bot Zh (Leningr), 59(12), 1728-1733, 1974.

Descriptors: *Aquatic plants, Ecology, *Analysis, *Vegetation.
Identifiers: *USSR, *Machrophytes.

This article was found in manuscript form in the personal papers of the late I.D. Bogdanovskaya-Guineneuf and probably dates to the early 1940s. It gives a brief synopsis of the aquatic macrophytic flora of the USSR, ecological factors affecting the distribution of aquatic vegetation, cenotypic characteristics, classification of higher aquatic vegetation, distribution of aquatic macrophytes in bodies of water, successions of vegetation, general patterns of the geographic distribution of higher aquatic vegetation and types of hydroseres.--Copyright 1975, Biological Abstracts, Inc.
W76-02848

A STUDY OF MINNESOTA FORESTS AND LAKES USING DATA FROM EARTH RESOURCES TECHNOLOGY SATELLITES, TWENTY-FOUR MONTH PROGRESS REPORT.
Minnesota Univ., Minneapolis. Space Sciences Center.
For primary bibliographic entry see Field 4A.
W76-02901

FOREST DISEASE DETECTION AND CONTROL,
Minnesota Univ., St. Paul. Dept. of Plant Pathology.
D. W. French.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 7-18, June 30, 1974. 2 fig, 3 tab. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Aerial photography, *Plant diseases, *Trees, Oak trees, Forests, Plant pathology, Diseases, Surveys, Photography, Costs, Cost-benefit ratio, Cost-benefit analysis, Data processing.
Identifiers: Elm trees.

Present techniques for detection of Durch elm disease by means of aerial photography are not satisfactory because of cost in relation to success (42%) of detection. It is feasible to use aerial photography for detecting oak wilt as it costs no more than ground survey, requires less time, and provides an accurate map of the infection centers. Detection of tree diseases from a helicopter is of value in checking on other methods of survey. (See also W76-02901) (Sims-ISWS)
W76-02902

FOREST VEGETATION CLASSIFICATION AND MANAGEMENT,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 4A.
W76-02904

THE EFFECT OF SURFACE DRAINAGE AND SUBSEQUENT STAND CUTTING ON CHANGES OF THE GRASS-MOSS COVER, (IN RUSSIAN),
O. V. Shakhova.
Lesovedenie, 1, 42-48, Illus, 1975.

Descriptors: *Surface drainage, Grasses, *Mosses, *Canopy, Cover crops.
Identifiers: *Grass-moss cover, Phytomass, *Stand cutting.

Surface drainage (ditches 0.4-5 m deep) and subsequent clearing by canopy removal has influenced the condition and composition of the grass-moss cover in Betuletum polytrichosum. Increases of the number of grass species, their abundance, phytomass and degree of coverage are strongly pronounced.--Copyright 1975, Biological Abstracts, Inc.
W76-02956

SODIUM RELATIONS IN DESERT PLANTS: 4. SOME PHYSIOLOGICAL RESPONSES OF ATRIPLEX CONFERTIFOLIA TO DIFFERENT LEVELS OF SODIUM CHLORIDE,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 3C.
W76-02968

INFLUENCE OF WATER STRESS ON PARAMETERS ASSOCIATED WITH HERBAGE QUALITY OF PANICUM MAXIMUM VAR. TRICHOGLUME,
Commonwealth Scientific and Industrial Research Organizations, St. Lucia (Australia), Div. of Tropical Agronomy.
J. R. Wilson, and T. T. Ng.
Australian Journal of Agriculture Research, Vol 26, No. 1, p 127-136, January, 1975. 3 fig, 3 tab, 31 ref.

Descriptors: *Moisture stress, *Plant physiology, *Plant growth, *Plant tissues, Drought tolerance, Moisture deficit, Water requirements, Soil-water-plant relationships, Root systems, Leaves, Flowering, Cellulose, Lignins, Fibers(Plants).
Identifiers: *Panicum maximum var. trichoglume, Drying-rewetting cycles, Total laminae, Specific laminae, Dry matter digestibility, Stem elongation, Ontogenetical changes, Cell wall.

Stress was applied to Panicum maximum var. trichoglume as a series of drying and re-wetting cycles, and harvests of total laminae, stem, root, and specific laminae were taken at different times after the start of stress treatment. The dry matter digestibility of the stressed plants compared to control plants was lower in leaves 4, 6, and 8 (counting from the tiller base), similar in total green laminae and in leaves 10 and 12, and high stem and dead laminae. The cell wall content of various tissues of the stressed plants was lower than that of the controls. Water stress delayed stem elongation, flowering, and possibly the normal ontogenetical changes of the leaves. The decrease in dry matter digestiblity in stressed plants was not associated with changes in proportions of cellulose, hemicellulose or lignin, but reflected a decline in digestibility of cell wall material. (Robinett-Arizona)
W76-02969

IMPORTANT ASPECTS OF THE RIVER NURSERY AREAS OF SALMON, (IN NORWEGIAN),
Zoologisk Museum, Oslo (Norway).
A. Lillehammer.
Fauna (Oslo). 28(1): 8-15. Illus. 1975.

Descriptors: River, *Salmon, *Fish food organisms, Environmental effects, Fish diets.

Aspects of the stream life of young salmon, Salmo salar L., are discussed. Food organisms and their response to change, both natural and man-made, in certain environmental factors are mentioned.--Copyright 1975, Biological Abstracts, Inc.
W76-02972

2J. Erosion and Sedimentation

EFFECTS OF GROUNDWATER SEEPAGE ON STREAM REGIMENT,
North Dakota Univ., Grand Forks. Dept. of Geology.
L. Clayton, and S. S. Harrison.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 075, $3.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo. Completion Report No WI-222-007-75, April, 1975. 9 p, 6 fig, 9 ref. OWRT B-004-NDAK(4). 14-01-0001-1040.

Descriptors: *Groundwater, Fluvial sediments, Rivers, Erosion, Sedimentation, *Seepage, Surface-groundwater relationships, Sediment transport, *Flumes, Streambeds, *Sediments.
Identifiers: *Stream competence.

Field observations of a small stream have indicated that seepage of water into or out of a stream may greatly alter stream competence. Theoretically, water seeping through the stream bed exerts a drag on quartz grains that changes stream competence by the factor 1.65/(1.65 - i) where i is the seepage gradient. Experiments in laboratory flumes, however, indicate that seepage through a stream bed, despite its effect on effective grain density, causes no change in competence in gaining streams nor in losing streams that lack a mud seal. Possibly the expected change in competence is partially counteracted by the accompanying changes in form drag and surface drag on the grains. Flume experiments also show that upward seepage reduces the steepness of bed forms and decreases bed roughness, whereas downward seepage steepens the bed forms and increases bed roughness, but these changes appear to be insufficient to cause any measurable change in the slope of the water surface. Downward seepage in the presence of sufficient suspended sediment, however, can lead to the formation of a mud seal on the surface of a stream bed; this results in a great increase of the effective density of the bed sediment and may result in the total elimination of sediment entrainment from the bed.
W76-02629

SCOUR AT BRIDGE WATERWAYS--A REVIEW,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-02684

PARTICLE SIZE DISTRIBUTIONS IN A REGION OF COASTAL UPWELLING ANALYZED BY CHARACTERISTIC VECTORS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W76-02697

THE IMPACT OF SUBURBANIZATION ON FLUVIAL GEOMORPHOLOGY,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-02702

SEDIMENT TRANSPORT FROM BIG SAGEBRUSH WATERSHEDS,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-02725

STAGES OF DEVELOPMENT OF GULLIES IN THE WEST,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
B. H. Heede.

In: Present and prospective technology for predicting sediment yields and sources, ARE-S-40, Sediment-yield Workshop, Oxford, Mississippi, November 1972, Proceedings, p 155-161, 5 fig, 2 tab, 10 ref.

Descriptors: *Gullies, *Watershed management, *Land forming, *Surface runoff, *Geomorphology, Gully erosion, Headward erosion, Storm runoff, Flow, Snowmelt, Streamflow, Vegetation effects, Watersheds(Basins), Topography, Sediment yield, Erosion rates, Slopes, Beds, Channels, Rivers, Equilibrium, Ephemeral streams, Mountains, Arizona, New Mexico, Nevada, California, Colorado, Hydrology.
Identifiers: Colorado Rocky Mountains, Discontinuous gullies, Dynamic equillibrium.

This discussion of the development stages of gullies is based on research conducted in the Colorado Rocky Mountain Area, New Mexico, Arizona, Nevada, and California where ephemeral gullies carry flows only at times of severe storm or spring snowmelt. They may develop in deserts, grass and brush lands, or open forests, changing with time as part of general landform evolution from youthful to old-age stages causing substantial differences in erosion rates and sediment yields. Discontinuous gullies represent a youthful stage. Pronounced changes in channel width and bed slopes as well as channel headward extension, leading to gully fusion, take place during transformation to a continuous gully, the early mature stage of development characterized by nick points on the channel bottom. Comparison of hydraulic geometry of gullies with that of rivers suggests that the mature stage should be characterized by dynamic equilibrium. Channel vegetation is seen as exerting a major influence on gully development. The author concludes that watershed managers would have a useful tool if gully stages could be expressed in terms of erosion rates and sediment yields, but as yet there are insufficient data for quantifying gullies in terms of gully mechanics and morphology. (Mills-Arizona)
W76-02727

WATERSHED INDICATORS OF LANDFORM DEVELOPMENT,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4D.
W76-02739

INCIPIENT MOTION AND SEDIMENT TRANSPORT,
Illinois State Water Survey, Urbana; and Illinois Univ. at Urbana-Champaign. Water Resources Center.
C. T. Yang.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY10, Proceedings paper No 10067, p 1679-1704, October 1973. 11 fig, 2 tab, 26 equ, 41 ref. OWRT B-075-ILL(1).

Descriptors: *Open channel flow, *Sediment transport, *Hydraulics, Boundary layers, Flow, Rivers, Statistical methods, Water flow, Velocity, Equations, Data collections, *Movement.
Identifiers: *Incipient motion, Formulas, Shields diagram.

A review of existing literature reveals some disadvantages of using Shields diagram as the criterion for incipient motion of sediment particles on an alluvial bed. A new criterion based on average flow velocity, fall velocity, and shear velocity Reynolds number is proposed herein with the supporting data collected by different investigators. This new criterion is used to calculate the dimensionless critical unit stream power in a dimensionless unit stream power equation for sediment transport. The dimensionless unit stream power is the ratio of the time rate of potential energy expenditure per unit weight of water and terminal fall velocity of the sediment. The concept of unit stream power can be applied to the study of sediment transport despite the existence of different bed configurations. More than 1,000 sets of data from both laboratory flumes and natural streams published by different authors are used to support this dimensionless equation for sediment transport. The data used in determining the criterion for incipient motion cover the hydraulically smooth, transition, and completely rough regimes; data used in verifying the proposed dimensionless unit stream power equation cover diversified conditions with particle size ranging from 0.15 mm to 1.71 mm. The effects of particle size, water temperature, and water depth on the total sediment concentration also are studied. (Bell-Cornell)
W76-02877

REMOTE SENSING IN LAKE SUPERIOR STUDIES,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2H.
W76-02908

VELOCITY--BED-FORM--TEXTURE PATTERNS OF MEANDER BENDS IN THE LOWER WABASH RIVER OF ILLINOIS AND INDIANA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
R. G. Jackson, II.
Geological Society of America Bulletin, Vol. 86, No. 11, p 1511-1522, November 1975. 18 fig, 3 tab, 36 ref.

Descriptors: *Sediments, *Geomorphology, *Rivers, *Sediment transport, *Velocity, *River beds, *Meanders, River systems, Particle size, Sediment distribution, Sand waves, Dunes, Hydraulics, Illinois, Indiana.
Identifiers: River bed forms, Sediment environment, *Wabash River(Ill Ind), Hydraulic geometry.

Meander bends in the lower Wabash River of Illinois and Indiana display coherent patterns of current velocity, bed topography, lower-regime bed forms, and bed-material size. The upstream reach of a bend is a zone of transition from the reversed hydraulic and sedimentologic conditions of the preceding bend. A downstream shift of the cross-sectional maximum velocity magnitude from the inner (point-bar side) bank to the oter bank defines a transitional zone for velocity magnitude in each bend; in this zone, current velocities are strongest and dunes and sand waves most prominently developed at near-bankfull and higher flows. Similar translations of the cross-sectional maxima of depth, mean size of bed material, and dune height and a reversal in the orientation of spiral flow define a transitional zone for each of these four other parameters in each bend. A given meander bend at any stream discharger shows the following sequence of increasing length of transition zones: spiral flow, depth, velocity magnitude, mean size of bed material, and dune height. Downstream from each transitional zone in a bend, the normal asymmetrical cross-sectional distribution of each papameter defines a fully developed zone for that parameter. In both sharply curved and gently curved bends, fully developed zones for bed-material size do not exist. Sharply curved bends do not contain fully developed zones for velocity magnitude, which in other bends show the strongest velocities and largest dunes at near-bankfull or lower flows, especially if the zone is bypassed by overland flow during higher stream discharges. (Lee-ISWS)
W76-02919

HIERARCHICAL ATTRIBUTES AND A UNIFYING MODEL OF BED FORMS COMPOSED OF COHESIONLESS MATERIAL AND PRODUCED BY SHEARING FLOW,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
R. G. Jackson, II.
Geological Society of America Bulletin, Vol. 86, No. 11, p 1523-1533, November 1975. 1 fig, 6 tab, 97 ref, 1 append.

Descriptors: *Sediments, *Geomorphology, Boundary layers, Turbulence, Dunes, River beds, River systems, Rivers, Particle size, Ripple marks, Sediment distribution, Sediment transport, Sediment-water interfaces, Meanders, Beds, Model studies.
Identifiers: *River bed forms, *Cohesionless materal, Shearing flow, Bed form size, Bed configuration, Sediment environments.

From those bed forms generated by the shearing flow of a fluid and composed of cohesionless granular material, 5 hierarchical attributes are recognized: bed-form size, time span of existnece of individual bed forms or bed configurations, super-positions, flow regime of bed forms in open-channel flows, and the Russian theory of channel process. The first two attributes permit the definition of three fundamental groups of bed forms common to all sedimentary environments dominated by shearing flow. The largest bed forms (macroforms), such as point bars, respond to the geomorphological regime of the environment and are relatively insensitive to changes in fluid-dynamic regime during an individual dynamic event (for example, a flood in a river). A two-zone structural model of turbulent boundary layers provides a genetic framework for the two smaller classes of bed forms. Mesoforms, such as dunes in rivers, respond to flow conditions in the outer zone of the rubulent boundary layer as the flow varies through a dynamic event; their lives scale correspondingly with the duration of that event. The smallest bed forms (microforms), such as current lineations, are governed by the flow structure in the inner zone; their lives are much shorter than the periodicity of dynamic events. These considerations consitute a unifying model of the origin of bed forms. Three essential components of the model (bed-form size, time, and structure of the turbulent boundary layer) are readily measurable by present experimental techniques. (Lee-ISWS)
W76-02920

GEOMORPHIC PROCESSES ACTIVE IN THE SOUTHWESTERN LOUISIANA CANAL, LAFOURCHE PARISH, LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
C. A. Whitehurst, and L. N. Doiron.
Available from the National Technical Information Service, Springfield, Va 22161, as N75-15128, $4.00 in paper copy, $2.25 in microfiche. Report RM5, October 1974. 39 p, 10 fig, 2 tab, 58 ref. NASA 19-001-97 and 19-001-024.

Descriptors: *Canals, *Louisiana, *Erosion, *Geomorphology, Wetlands, Marshes, Sediments, Sedimentation, Deposition(Sediments), Tides, Tidal marshes, Tidal waters, Tidal effects, Navigation, Remote sensing, Aircraft, Estuaries.
Identifiers: *Lafourche Parish(La), *Southwestern Louisiana Canal(La).

The canals in the Louisiana coastal marshes were dredged through soft muck that is highly susceptible to erosion. Although they were initially man-made features, the canals are undergoing constant changes, as would any natural morphological form in a dynamic environment. Erosive agents such as boat wakes, tidal currents, wind waves, and wildlife activity have resulted in significant widening and deepening. The Southwestern Louisiana Canal (East-West Canal), was chosen as the study area. Field work, laboratory analyses, and interpretation of infrared color imagery were used to provide data for study. The field work was conducted from May to October of 1973 to quantify the rates or erosion and locate areas of deposition. Erosion is the major process occurring in the Canal, with deposition being evident in only two locations. The erosion is self-perpetuating. The continuous decrease in the slope of the canal banks and the in-

crease in the dispersion of energy is accompanied by an increase in the erosive energy as the tidal prisms increase in size. The ratio of the increase of energy dispersion to the increase of current energy is not known. Erosion rates measured during this study ranged between 0.094 and 2.868 cm per day, but these rates also varied according to bank material and location. The study showed that channel erosion rates progressively increase, with no indications of stabilization. (Sims-ISWS)
W76-02930

EVALUATION OF STOCHASTIC MODELS DESCRIBING MOVEMENT OF SEDIMENT PARTICLES ON RIVERBEDS,
Ecole Polytechnique de Montreal (Quebec); and Geological Survey, Denver, Colo.
P. Todorovic, and C. F. Nordin, Jr.
Journal of Research of the US Geological Survey, Vol 3, No 5, p 513-517, September-October, 1975. 5 fig, 8 ref.

Descriptors: *Sediment transport, *Particle size, *River beds, *Stochastic processes, *Reviews, Evaluation, Model studies.

Various stochastic models have been proposed to describe the movement of sediment particles on the riverbed. This report summarizes the most important theoretical results in this field. The approach adopted is based on the fact that most of the stochastic models are only special cases of a particular kind of random walk on the straight line. (Woodard-USGS)
W76-02959

GEOMORPHIC EVIDENCE FOR LATE HOLOCENE TILTING IN SOUTHERN SAN MATEO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
D. P. Adam.
Journal of Research of the US Geological Survey, Vol 3, No 5, p 613-617, September-October 1975. 3 fig, 11 ref.

Descriptors: *Geomorphology, *Land farming, *Faults(Geologic), *California, Streamflow, Diversion, Alluvium, Geologic time, Geological surveys, Radioactive dating, Channels.
Identifiers: *San Mateo County(Calif), *Land tilting.

Relations between stream channels and alluvial deposits along Bradley Creek and the lower part of Butano Creek in southern San Mateo County, California, suggest that the area has been tilted very recently. Localized swampy conditions supply additional supporting evidence. Radiocarbon dates show that some of the valley alluvium along Butano Creek was deposited no more than 750-800 years ago, and tilting must have occurred since that time. Observations indicate that, at least in the vicinity of Pescardero, tilting is still active. The evidence suggests no particular cause for the tilting, but it may be related to movement on the San Gregorio fault, a branch of the San Andreas fault system that passes through the area. (Woodard-USGS)
W76-02960

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
E. J. Pluhowski.
Type II progress report for Goddard Space Flight Center, July 1, 1974. 4 p.

Descriptors: *Sediment transport, *Tracking techniques, *Aerial photography, *Satellites(Artificial), *Lake Ontario, Inflow, Turbidity currents, Winds, Streamflow, Lake sediments, Erosion, Remote sensing.
Identifiers: *Niagara River, *Turbidity plumes, *Suspended sediment.

Although turbidity plumes in Lake Ontario usually are not visible by satellite imagery during the winter, meterologic and hydrologic events may combine to ensure their detection. The clearly defined Niagara River plume of January 25, 1974, was the result of turbid water entering the river at its source near the eastern end of Lake Erie. A persistent southwest wind and mild temperatures resulted in a pile-up of ice-free but turbid water at the source of Niagara River where the highly colored water entered the river. Upon discharge into Lake Ontario, the Niagara River water appears several shades lighter in tone than the ambient lake water. On February 12, 1974, eastward moving ice flows along the Ontario shoreline were forced to move around the hydraulic barrier created by the Niagara River jet. As a result the Niagara River plume was clearly portrayed by a halo-like band of slush ice borne by wind-driven nearshore currents. (Woodard-USGS)
W76-02963

SEDIMENT YIELD OF SELECTED WATERSHEDS WEST OF THE GREAT PLAINS,
Arizona Univ., Tucson, Dept. of Watershed Management.
C. J. Paskett.
Master of Science Thesis, 1974, 72 p, 18 fig, 7 tab, 48 ref.

Descriptors: *Sediment yield, *Climatic zones, *Rainfall-runoff relationsships, *Great Plains, *Sediment transport, Climates, Deserts, Grasslands, Forests, Runoff, Watersheds, Erosion, Topography, Regression analysis, Forecasting, Mathematical studies, Model studies, New Mexico, California, Oregon, Utah, Washington, Wyoming.

Summarized are the roles of climate and runoff in eroding and transporting sediment from a selected group of large watershed basins in New Mexico, California, Oregon, Utah, Wyoming, and Washington. Annual sediment yields representing a total of 178 data years of 17 watersheds were correlated with climate in four separate regression models. An analysis of the regression equations describes the relative influence of desert, steppe, and forest climates in eroding sediment. The probabilistic models developed provide a forecast of yields and their relative frequency of occurrence. Desert climates produce maximal sediment yields, but those from forest climates were relatively high, thought to be a reaction caused by efficient sediment transport systems associated with mountainous terrain. Results are compared with those of other sediment yield models. (Mills-Arizona)
W76-02971

2K. Chemical Processes

CHRIS APPENDIXES I-VI. (PRELIMINARY SYSTEMS DEVELOPMENT-CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM-CHRIS)
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-02552

OSCILLATOR CIRCUIT FOR PROVIDING A CONDUCTIVITY RATIO OF SEA WATER,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 7B.
W76-02594

WATER QUALITY DETERMINATION APPARATUS,
Kabushiki Kaisha Meidensha, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5A.
W76-02596

INTERACTIONS OF METALS AND SIMPLE OXYANIONS IN WATER,
North Dakota State Univ., Fargo. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-02633

GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 2. AN EVALUATION OF THERMAL WATER IN THE BRUNEAU-GRAND VIEW AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 4B.
W76-02655

ECOLOGICAL RAMIFICATIONS OF SILVER IODIDE NUCLEATING AGENT ACCUMULATION IN A SEMI-ARID GRASSLANDS ENVIRONMENT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 3B.
W76-02665

RESULTS OF SEA SURFACE MAPPING IN THE PERU UPWELLING SYSTEM,
San Francisco State Univ., Calif. School of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-02698

CHEMISTRY OF EFFERVESCING GROUNDWATER FROM MUNICIPAL WELLS, FLAGSTAFF, ARIZONA,
Northern Arizona Univ., Flagstaff.
For primary bibliographic entry see Field 4B.
W76-02749

FORMATION OF METHYL MERCURY BY BACTERIA,
Georgia Univ., Atlanta. Dept. of Food Science.
For primary bibliographic entry see Field 5A.
W76-02812

SELECTION OF THRESHOLD VALUES IN GEOCHEMICAL DATA USING PROBABILITY GRAPHS,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
A. J. Sinclair.
Journal of Geochemical Exploration, Vol 3, No 2, p 129-149, May, 1974. 9 fig, 7 tab, 13 ref.

Descriptors: *Data processing, *Statistical methods, *Probability, *Geochemistry.
Identifiers: *Geochemical data, *Threshold values, *Probability graphs.

A method of choosing threshold values between anomalous and background geochemical data, based on partitioning a cumulative probability plot of the data is described. It can be used for any polymodal distribution if sufficient data of adequate quality are present so that partitioning is feasible. As a rule such distributions for geochemical data closely approach a lognormal model. A grouping of the data values is obtained that can be invaluable in interpretation, and, therefore, is potentially more useful than other common methods. (Hoyle-Vanderbilt)
W76-02892

BIOGEOCHEMICAL EXPLORATION FOR TUNGSTEN AT BARRYTOWN, NEW ZEALAND,
Massey Univ., Palmerston North (New Zealand).
For primary bibliographic entry see Field 5A.
W76-02893

GROUND-WATER RESOURCES OF AMERICAN SAMOA WITH EMPHASIS ON THE TAFUNA-LEONE PLAIN, TUTUILA ISLAND,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 4B.
W76-02950

EFFECTS OF ORGANIC SOLUTES ON CHEMICAL REACTIONS OF ALUMINUM,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-02953

2L. Estuaries

MEASUREMENT AND ANALYSIS OF TEMPORAL VARIATIONS OF SALINITY IN SHALLOW WATER,
Naval Postgraduate School, Monterey, Calif.
L. K. Kane, II.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-003 536, $5.00 in paper copy, $2.25 in microfiche. M.S. Thesis, September 1974. 80 p, 33 fig, 2 tab, 18 ref.

Descriptors: *Instrumentation, *Conductivity, *Salinity, Temperature, Measurement, Analysis, Shallow water, On-site investigations, Sea water, Saline water, Chemical properties, Water properties, Oceanography.
Identifiers: Energy density spectra.

A four-electrode conductivity instrument was developed to determine variations of conductivity in an ocean environment at a fixed point. A field experiment was conducted in Mission Bay, San Diego, California. Results indicated that the instrument functioned properly and accurately resolved conductivity microstructure. From conductivity and associated temperature data, salinity data was derived which portrays a well-mixed salinity structure. Difficulty with a mismatch of time constants between conductivity and temperature instruments prevented the accurate determination of salinity microstructure, although there was evidence that one existed. (Sims-ISWS)
W76-02542

SMALL-CRAFT HARBORS: DESIGN, CONSTRUCTION, AND OPERATION,
Moffatt and Nichol, Long Beach, Calif.
For primary bibliographic entry see Field 8A.
W76-02548

THE EFFECTS OF CURRENTS AND WAVES ON AN OIL SLICK RETAINED BY A BARRIER,
Texas A and M Research Foundation, College Station.
For primary bibliographic entry see Field 5G.
W76-02549

FREEZEUP PROCESSES ON ARCTIC BEACHES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W76-02551

LARGE SYSTEMS APPROACH TO WATER QUALITY MODELLING AND MANAGEMENT,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5B.
W76-02564

DISTRIBUTED PARAMETER SYSTEMS APPROXIMATION FOR ESTUARINE WATER QUALITY MODELLING AND CONTROL,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5B.
W76-02565

SOME INSTITUTIONAL CONSTRAINTS TO COASTAL ZONE MANAGEMENT: A CASE STUDY OF HAWAII,
Hawaii Univ., Honolulu. Coll. of Tropical Agriculture.
For primary bibliographic entry see Field 6E.
W76-02624

THE DELAWARE ESTUARY SYSTEM, ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC EFFECTS: ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W76-02626

REVIEW OF MODELS OF TIDAL WATERS,
Monash Univ., Clayton (Australia), Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W76-02689

ANNUAL AND LONGER TERM VARIATIONS OF DEEPWATER PROPERTIES IN THE COASTAL WATERS OF SOUTHERN BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
G. L. Pickard.
Journal Fisheries Research Board of Canada, Vol 32, No 9, p 1561-1587, September 1975. 17 fig, 6 tab, 16 ref.

Descriptors: *Inlets(Waterways), *Bathymetry, *Estuarine environment, *Temporal distribution, Estuaries, Temperature, Salinity, Density, Dissolved oxygen, Depth, Time series analysis, Data collections, Analysis, Deep water, Variability, Oceanography, On-site investigations.
Identifiers: *British Columbia(Canada), Annual variation.

Observations of deepwater properties (temperature, salinity, dissolved oxygen, and the derived values of density) were assembled from the Data Reports of the Institute of Oceanography of the University of British Columbia, and values of the first three properties were presented to show the characteristics of their annual variations at 18 locations in the coastal waters of southern British Columbia. Information on the long-term variations (for 6 yr or more) of all properties was presented for eight of the locations. Variations of 1-yr period were evident to 100 m depth at all locations and to 300 m or more at many of them. The variations were of different forms, sinusoidal, peaked or saw-tooth, and there were some differences in phase between the property variations at different locations. Long-term variations (over several years) of annual mean values were small and decreased with increase of depth. Much of the evidence suggested that the changes below 100 m depth were due to longitudinal advection (flow) from elsewhere rather than to vertical transfers from the sea surface in the immediate locality. (Adams-ISWS)
W76-02693

STRATIFIED LAKE AND OCEANIC BRINES: SALT MOVEMENT AND TIME LIMITS OF EXISTENCE,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W76-02696

PARTICLE SIZE DISTRIBUTIONS IN A REGION OF COASTAL UPWELLING ANALYZED BY CHARACTERISTIC VECTORS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W76-02697

RESULTS OF SEA SURFACE MAPPING IN THE PERU UPWELLING SYSTEM,
San Francisco State Univ., Calif. School of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-02698

(OPTIMAL DESIGN FOR WAVE SPECTRUM ESTIMATES,
Delaware Univ., Newark.
M. A. Tayfun, C. Y. Yang, and G. C. Hsiao.
Journal of Geophysical Research, Vol 80, No 15, p 1937-1947, May 20, 1975. 5 fig, 2 tab, 25 ref, 3 append. ONR N00014-69-40407.

Descriptors: *Waves(Water), *Ocean waves, *Model studies, Mathematical models, Computer models, Estimating, Analytical techniques, Beaches, Coasts, Lakes, Oceans, Estuaries.
Identifiers: *Wave spectra, Storm-generated waves.

The applicability of the existing estimating methods is restricted to the stationarity conditions in a wave field. For nonstationary conditions a generalization of the conventational definition of spectrum as a distribution in both time and frequency suggests a filtering technique for spectral estimations. The statistical estimation erros associated with the general form of estimates were concisely described in a relative mean square error criterion. A minimization of this error as an overall figure of merit for the accuracy of estimates yielded an optimal procedure for constructing an estimate that can be regarded as the most accurate one for the given physical wave data. Concepts were illustrated with actual wave data analysis, and the validity of the optimal procedure was demonstrated by simulation and comparison with the results from conventional techniques. (Sims-ISWS)
W76-02705

POSSIBLE BOTTOM CURRENT RESPONSE TO SURFACE WINDS IN THE HUDSON SHELF CHANNEL,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
L. W. Lavelle, G. H. Keller, and T. L. Clarke.
Journal of Geophysical Research, Vol 80, No 15, p 1953-1956, May 20, 1975. 4 fig, 9 ref.

Descriptors: *Currents(Water), *Winds, *Continental shelf, Estuaries, Coasts, Ocean currents, Water circulation, Oceanography, Measurement, On-site investigations, Data processing, New York.
Identifiers: *Hudson Shelf Channel, *New York Bight.

Current measurements made in the Hudson Shelf Channel during the summer of 1973 showed essentially channel axial bottom current even though the channel aspect ratio is small in the area of measurement. Although the current record is of short duration, correlation of water movement with surface winds was suggested by the data. The sense of summertime nontidal bottom flow in the channel (up or down channel) would appear to be controlled by the surface wind direction (offshore or onshore). These results would suggest the likelihood of net down-channel flow during the summer months. (Sims-ISWS)
W76-02706

A MODEL OF SIMPLE RAFTING IN SEA ICE,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
For primary bibliographic entry see Field 2C.
W76-02708

HORIZONTAL SCALES OF MIDOCEAN INTERNAL TIDES,
Scripps Institution of Oceanography, La Jolla, Calif.
T. P. Barnett, and R. L. Bernstein.
Journal of Geophysical Research, Vol 80, No 15, p 1962-1964, May 20, 1975. 4 fig, 1 tab, 14 ref. ONR N00014-69-A-0200-6043.

Descriptors: *Oceans, *Tides, *Pacific Ocean, Temperature, Measurement, Buoys, On-site investigations, On-site data collections, Oceanography, Data processing, Analytical techniques.
Identifiers: *Midocean internal tides, Semidiurnal tides, Temperature spectra.

The space scales associated with the semidiurnal internal tides in the central Pacific were investigated by using time series of temperature obtained from moored buoy arrays. Excellent phase coherence was found in the vertical from near the surface to depths exceeding 150 m. Phase coherence existed horizontally over distances of at least 5 but less than 50 km. With one exception the thermobaric energy associated with the semidiurnal tide showed no coherence in either the vertical (0-150 m) or the horizontal (5-500 km). (Sims-ISWS)
W76-02709

MEASUREMENT OF INTERNAL WAVES OF TIDAL FREQUENCY NEAR A CONTINENTAL BOUNDARY,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environment Lab.
W. B. Barbee, J. G. Dworski, J. D. Irish, L. H. Larsen, and M. Rattray, Jr.
Journal of Geophysical Research, Vol 80, No 15, p 1965-1974, May 20, 1975. 7 fig, 8 tab, 22 ref. ONR NOR 014-67-A-0103-0014, NSF GA 30745X.

Descriptors: *Internal waves, *Continental shelf, *Pacific Ocean, Temperature, Salinity, Coasts, Tides, On-site investigations, On-site data collections, Data processing, Analytical techniques, Oceanography, Measurement.
Identifiers: *Vancouver Island(Canada), Temperature spectra.

The internal wave field seaward of the continental shelf break off Vancouver Island, British Columbia, was measured with an array of four moored temperature sensors and numerous salinity-temperature depth casts. These measurements have been analyzed for their energy content at the semidiurnal tidal frequency, and the results compared with a theory of generation of internal tides at a shelf break. A peak in amplitude was observed at a depth slightly greater than that predicted by the theory. The observed phase change across this peak is consistent with seaward propagation of energy from the shelf break. (Sims-ISWS)
W76-02710

VERTICAL ENERGY PROPAGATION OF INERTIAL WAVES: A VECTOR SPECTRAL ANALYSIS OF VELOCITY PROFILES,
Woods Hole Oceanographic Institution, Mass.
K. D. Leaman, and T. B. Sanford.
Journal of Geophysical Research, Vol 80, No 15, p 1975-1978, May 20, 1975. 5 fig, 1 tab, 3 ref.

Descriptors: *Waves(Water), *Ocean waves, *Atlantic Ocean, Velocity, On-site data collections, Data processing, Analytical techniques, Oceanography.
Identifiers: *Velocity profiles, Inertial waves, Brunt-Vaisala frequency, Vector spectral analysis.

Vertical propagation of near-inertial period waves has been detected in a series of recent velocity profiles by a technique of vector spectral analysis. This method, previously applied to vector series in time, has been used to study the vertical spatial structure of velocity profiles obtained in the Mid-Ocean Dynamics Experiment (MODE). Prior to the use of spectral analysis, however, it is necessary to minimize the influence of vertical variations of the Brunt-Vaisala frequency. The procedure was to normalize the current amplitudes and stretch the vertical coordinate according to a WKB scheme. The vector spectral analysis, applied to the normalized and stretched profiles, yielded wave polarization estimates which are related to the sign of the vertical group velocity of internal waves. The analysis of a set of velocity profiles indicated that the net energy flux of the waves near the inertial frequency is downward. (Sims-ISWS)
W76-02711

SIGNIFICANCE OF VITAMINE B12 IN MARINE BIOCENOSES, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
For primary bibliographic entry see Field 5A.
W76-02719

PRINCIPAL TENDENCIES IN THE BIOLOGY OF THE MODERN BALTIC SEA, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.
For primary bibliographic entry see Field 5C.
W76-02770

ACCUMULATION OF THE IRON GROUP ELEMENTS BY PHYTOPLANKTON, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii.
For primary bibliographic entry see Field 5B.
W76-02772

SOME ECOLOGIC CONSIDERATIONS ON THE FLORA AND FAUNA OF THE SOUTHERN PART OF THE MUSURA BAY (THE DELTA OF THE DANUBE INTO THE BLACK SEA), (IN FRENCH),
D. Manoleli, L. Gruia, and T. Nalbant.
Trav Mus Hist Nat 'Grigore Antipa', 15: 149-172, Illus. 1974. (Engl., Rom., and Russ. summary).

Descriptors: *Benthic fauna, *Algae, *Distribution patterns, Bays, Ecology, Deltas.
Identifiers: *Black Sea, *Danube delta, *Romania(Musura Bay).

The pattern of distribution of benthic algae and fauna in the southern part of Musura Bay is discussed. The physical and chemical conditions in this part of the bay are also given.--Copyright 1975, Biological Abstracts, Inc.
W76-02909

BAROCLINIC INSTABILITY OVER A SLOPE. PART I: LINEAR THEORY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
J. E. Hart.
Journal of Physical Oceanography, Vol 5, No 4, p 625-633, October 1975. 5 fig, 3 tab, 7 ref, 1 append.

Descriptors: *Theoretical analysis, *Froude number, *Ocean circulation, *Ocean currents, Fluid mechanics, Equations, Pressure, Currents(Water), Slopes, Oceanography, Model studies.
Identifiers: *Instability, Linear theory, Two-layer ocean, Baroclinic flow, Rossby number, Sloping seabed, Gyres.

The instability properties of a circular current in the upper layer of a two-layer quasi-geostrophic ocean over a unidirectional bottom slope were investigated. This flow and topography geometry was intended as a crude model of geostrophic gyres where the variation of the Coriolis force is negligible. Such currents occur in the Arctic and in Gulf Stream rings. The slope destablizes the flow; the critical Froude number is lowered as the slope was increased. Baroclinic instabilities tend to generate time-independent or mean currents in the upper and lower layers which, because of the slope, are markedly asymmetric across the gyre. (See also W76-02918) (Adams-ISWS)
W76-02917

BAROCLINIC INSTABILITY OVER A SLOPE. PART II: FINITE-AMPLITUDE THEORY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
J. E. Hart.
Journal of Physical Oceanography, Vol 5, No 4, p 634-641, October 1975. 3 fig, 1 tab, 7 ref, 1 append.

Descriptors: *Theorectical analysis, *Froude number, *Ocean circulation, *Ocean currents, Fluid mechanics, Equations, Pressure, Currents(Water), Slopes, Flow, Waves(Water).
Identifiers: *Instability, Finite-amplitude theory, Two-layer ocean, Baroclinic flow, Rossby number, Sloping seabed, Gyres.

Baroclinic instability of a circular current has been found to be modified by the presence of a unidirectional bottom slope. Atheory was developed for the slightly unstable flow regime over a weak slope. The slope created azimuthal sidebands to the basic azimuthal wavenumber of the instability. Interaction of the sidebands with the slope caused a decrease in the stability of the flow compared with the case with a flat bottom. Interation of the sidebands with the primary baroclinic wave produced a time-independent asymmetric current. The basic wave self-interaction produced a time-independent current which flowed up the slope and generated asymmetric vorticity. This effect was predominant when the Rossby radius of deformation was much smaller than the radius of the basic current. (See also W76-02917) (Adams-ISWS
W76-02918

GEOMORPHIC PROCESSES ACTIVE IN THE SOUTHWESTERN LOUISIANA CANAL, LAFOURCHE PARISH, LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 2J.
W76-02930

COMPARATIVE STUDY OF FRESH-SALT WATER INTERFACES USING FINITE ELEMENT AND SIMPLE APPROACHES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
A-A. I. Kashef, and M. M. Safar.
Water Resources Bulletin, Vol 11, No 4, p 651-665, August 1975. 3 fig, 4 tab, 15 ref, 1 append. OWRT C-4061 (No 9013) (3).

Descriptors: *Saline water intrusion, *Artesian aquifers, *Groundwater movement, *Finite element analysis, *Water resources, Earth dams, Analytical techniques, Methodology, Interfaces, LaPlaces equation, Saline water-freshwater interfaces, Aquifers, Dams, Groundwater, Coasts.
Identifiers: *Dupuit's equation, Hydraulic forces method.

The fresh-salt water interface in artesian aquifers has been investigated by various techniques on the basis of its analogy to the free surface in earth dams or cores of dams. Some more or less exact solutions exist with various approximations. A simple method was developed by analyzing hydraulic forces. A finite element method was suggested and the results compared with the method of hydraulic forces. The presented procedure eliminates some of the difficulties and uncertainties in current finite element procedures. When management problems are studied, the complex existing conditions under natural flow can be

determined simply by Dupuit's equation when the length of intruded zone or base width of an earth rectangular section exceeds the thickness of the artesin artesian aquifer. (Singh-ISWS)
W76-02940

INVESTIGATION OF MATHEMATICAL MODELS FOR THE PHYSICAL FATE PREDICTION OF DREDGED MATERIAL,
Army Engineer Waterwasys Experiment Station, Vicksburg, Miss. Office of Dredged Material Research.
For primary bibliographic entry see Field 5B.
W76-02946

MODELS AND THE DECISION MAKING PROCESS: THE HUDSON RIVER POWER PLANT CASE,
Brookhaven National Lab., Upton, N.Y. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W76-02987

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

MEMBRANE EVAPORATOR/SUBLIMATOR INVESTIGATION,
AiResearch Mfg. Co., Los Angeles, Calif.
J. Elam, J. Ruder, and H. Strumpf.
Available from the National Technical Information Service, Springfield Va 22161 as N74 33588, $4.00 in paper copy, $2.25 in microfiche. Report No 74-10256, April 2, 1974. 38 p, 18 fig, 6 tab, 10 ref. NASA NAS9-10465.

Descriptors: *Membranes, *Semipermeable membranes, *Cooling, Water cooling, Air conditioning, Evaporation, Sublimation, Evaporators, Equipment, Laboratory tests, Engineering, Membrane processes, Separation techniques, Desalination.
Identifiers: *Life support systems, Membrane evaporators, Membrane sublimators, Hollow fiber membranes.

The purpose of the membrane evaporator/sublimator program was to develop data on a new evaporator/sublimator concept using a hollow fiber membrane unit with a high permeability to liquid water. The aim of the program was to obtain a more reliable, lightweight, and simpler Extra Vehicular Life Support System (EVLSS) cooling concept than is currently being used. The program consisted of evaluating possible materials to be tested as an evaporator/sublimator, running tests on various units in a vacuum chamber to test out the feasibility of the concept, and then analyzing the results of the program to obtain a design integrated with a recirculating thermal control water loop. Two available membrane units were tested in a vacuum chamber. In one unit the hollow fiber material was cellulose acetate, and in the other unit the material was cellulose. Both units achieved a cooling rate in excess pf 12,000 Btu per hour (the test units weighed about one pound net). The cellulose acetate unit operatedsuccessfully only as an evaporator; it forze when operated as a sublimator. The cellulose unit operated sucessfully in both the evaporation/sublimation regimes. The test was highly successful and proved out the concept of cooling by permeation through semipermeable membranes. The specific cooling capacity of the unit (BTU/lb of unit) was several times greater than that obtained with present configurations. (Sims-ISWS)
W76-02538

MEMBRANE HUMIDITY CONTROL INVESTIGATION,
AiResearch Mfg. Co., Los Angeles, Calif.
J. Elam, J. Ruder, and H. Strumpf.
Available from the National Technical Information Service, Springfield, Va 22161 as N74 33590, $4.00 in paper copy, $2.25 in microfiche. Report No 74-10255, April 15, 1975. 26 p, 7 fig, 6 tab, 14 ref. NASA NAS9-10465.

Descriptors: *Membranes, *Semipermeable membranes, *Drying, Water vapor, Air, Separation techniques, Laboratory tests, Membrane processes, Equipment, Evaluation, Engineering, Desalination.
Identifiers: *Life support systems, *Membranes dehumidifers, Hollow fiber membranes.

The purpose of the membrane humidity control program was to obtain basic performance data on a hollow fiber membrane unit that removes water vapor from a breathing gas loop by diffusion. With this approach no coolant or vapor condensation is required and very low outlet dew points are possible. A hollow fiber membrane unit made of cellulose acetate was tested to determine the permeability to gas and water vapor. Using the data obtained, an analysis was performed to determine a configuration and preliminary design for a flight unit. Several possible available hollow fiber materials were evaluated for use as a dehumidifier. The most promising materials found were cellulose and cellulose acetate. These materials have extremely high permeability constants for water vapor and, thus, would result in relatively small units. With the available laboratory unit, the maximum flow rate that could be obtained was approximately 2.5 lb/hr. At this low rate, extreme difficulty was experienced withthe test setup in obtaining a constant humidity level in the inlet gas stream, especially at dew points above ambient. The test setup required the use of heated insulated lines and infra-red lamps to prevent condensation. (Sims-ISWS)
W76-02539

AN ADVANCED SEEDING PROCESS IN SALINE WATER CONVERSION,
Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany). Institut fuer Werkstoftechnologie.
K. R. Frohner, and H. Panahandeh.
Available from the National Technical Information Service, Springfield Va 22161 as GKSS 74E 40, $3.50 in paper copy, $2.25 in microfiche. Report GKSS 74/E/40, Paper presented at the GVC-AIChE-Joint Meeting, Munich, September 17-20, 1974. 19 p, 5 fig, 1 tab, 14 ref.

Descriptors: *Desalination, *Desalination processes, *Flash distillation, *Scaling, Calcium sulfate, Descaling, Treatment, Water treatment, Sea water, Saline water, Water purification, Separation techniques, Demineralization.
Identifiers: *Barium sulfate.

The maximum process temperature in thermal saline water conversion plants, e.g., multi-stage flash evaporators, is at present limited by the production of calcium sulfate scale on heat transfer surfaces. The so-called seeding process, using calcium carbonate or sulfate as a seed, is effective in limiting calcium scale formation but suffers from several disadvantages. They can probably be overcome by the use of barium sulfate as a seed. Finely powdered barite has shown its effectivity as a seed in several pilot plant experiments. Based on these results, a technical feasibility study has been elaborated. It is presented as a multi-stage flash evaporator plant working according to the barium sulfate seeding process (BSS). This process comprises recycling of the barium sulfate seed and, in addition, inherent diminution of the Ca concentration in the circulated brine. (Sims-ISWS)
W76-02540

MEMBRANE WATER DEAERATOR INVESTIGATION,
AiResearch Mfg. Co., Los Angeles, Calif.
For primary bibliographic entry see Field 5F.
W76-02541

APPARATUS FOR THE TREATMENT OF WATER SOLUTIONS BY ION EXCHANGE,
Hager and Elsaesser, Stuttgart-Vaihingen (West Germany). (Assignee).
For primary bibliographic entry see Field 5D.
W76-02609

CHARGE-MOSAIC MEMBRANES,
Harvard Medical School, Boston, Mass. Biophysical Lab.
J. N. Weinstein, and S. R. Caplan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-236 615 price of $10.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report INT-OSW-RDPR-74-987, July 1974, 298 p, 72 fig, 27 tab, 211 ref, 1 append. OWRT Contracts 14-01-0001-977, 14-01-0001-2148 and 14-30-3145.

Descriptors: *Desalination, *Membrane processes, *Membranes, *Dialysis, *Electro-osmosis, Separation techniques, Waste water treatment.
Identifiers: *Piezodialysis, *Mosaic membranes, *Charge-mosaic membranes, Composite membranes, Salt flux.

A charge-mosaic membrane consists of a set of anion and cation exchange elements arranged in parallel, each element providing a continuous pathway from one bathing solution to the other. If a gradient of electrolyte concentration is established across the membrane, anions and cations can flow in parallel through their respective pathways without a violation of macroscopic electroneutrality. In electrical terms, these flows appear as a circulation of current which short-circuits the concentration potentials across the individual ion exchange elements. As a result, the charge-mosaic typically shows a salt permeability orders of magnitude greater than the intrinsic salt permeabilities of its constituent parts. If pressure is applied on one side of the charge-mosaic, the resulting streaming potentials are likewise short-circuited by circulation of current, and the solution emerging on the low pressure side is likely to be more concentrated than that on the high pressure side. This notion underlies 'piezodialysis', a novel and possibly important technique for desalination of sea water. The charge-mosaic can also be used to achieve new ranges of separations in dialysis, hemodialysis, equilibrium dialysis, and a potentially-portable artificial kidney. The analytical tools used in this work are most immediately applicable to macroscopic systems, which category may or may not include biological membranes, depending on the precise question at issue. Common biological models which look and function like mosaics include the 'parallel pumps,' 'pump leaks,' and 'parallel-leaks,' as well as the whole host of equivalent circuits. (OWRT)
W76-02734

APPLICATIONS OF DIRECT OSMOSIS: DESIGN CHARACTERISTICS FOR HYDRATION AND DEHYDRATION,
Arizona Univ., Tucson. Dept. of Physics.
For primary bibliographic entry see Field 5D.
W76-02745

MULTIPLE RE-USE OF WATER,
For primary bibliographic entry see Field 5D.
W76-02816

3B. Water Yield Improvement

CARBON BLACK INCREASES SNOWMELT AND FORAGE AVAILABILITY ON DEER WINTER RANGE IN COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
W. L. Regelin, and O. C. Wallmo.
U.S. Department of Agriculture, Forest Service, Research Note RM-296, 4 p, September,, 1975. 11 ref.

Descriptors: *Snowmelt, *Forages, *Rocky Mountain Region, *Carbon, Snow management, Deer, Air temperature, Mountains, Slopes, Melting, Wildlife, Activated carbon, Winter, Seasonal, Colorado.
Identifiers: *Carbon black.

Carbon black offers a potential method of increasing the availabily of deer forage on winter ranges in Colorado. On slopes with a southern exposure, over 40 cm of snow was melted to bare ground in February when air temperatures averaged -8.8C during daylight hours. Addition of the carbon black did not alter snow density. (Witt-IPC)
W76-02518

EFFECTS OF RAINFALL AND TEMPERATURE ON THE DISTRIBUTION AND BEHAVIOR OF LARREA TRIDENTATA (CREOSOTE-BUSH) IN THE MOJAVE DESERT OF NEVADA,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 2I.
W76-02524

THE ICE NUCLEATING PROPERTIES OF AN ULTRAFINE AEROSOL OF PURE SILVER IODIDE,
Paris-6 Univ. (France). Laboratoire de Meteorologie.
For primary bibliographic entry see Field 2B.
W76-02554

SILVER IODIDE AEROSOL PRODUCTION BY A PLATED HOT-WIRE GENERATOR,
Wisconsin Univ., Madison. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W76-02555

VEGETATION RESPONSES TO GRAZING, RAINFALL, SITE CONDITION, AND MESQUITE CONTROL ON SEMIDESERT RANGE,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2I.
W76-02663

ECOLOGICAL RAMIFICATIONS OF SILVER IODIDE NUCLEATING AGENT ACCUMULATION IN A SEMI-ARID GRASSLANDS ENVIRONMENT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
D. A. Klein, and E. M. Molise.
Journal of Applied Meteorology, Vol 14, No 5, p 673-680, August, 1975. 3 fig, 6 tab, 31 ref.

Descriptors: *Weather modification, *Chemical precipitation, *Silver iodide, *Environmental effects, *Grasslands, Arid lands, Soil microorganisms, Bacteria, Carbon dioxide, Root zone, Grasses, Ecology, Soils, Nitrates, Cloud seeding.
Identifiers: Silver nitrate, Mineralization.

Possible ecological effect of silver iodide accumulation which might result from weather modification programs are examined. After three growing seasons, silver iodide presence above levels expected from weather modification appears related to decreased soil oxygen uptake, carbon dioxide evolution, and bacterial glucose mineralization activities. The threshold for possible observation of decreased mineralization is in the range of 1-2 micrograms g(-1) silver. A significant increase in silver-reducing microorganisms was noted only in the high-level silver nitrate treated soils. Analysis of silver distribution suggests concentration in the plant root zone, with lesser levels in grasses from silver iodide than from silver nitrate. Silver levels which might accumulate in soils appear to be at least 1-2 magnitudes below those where first silver iodide effects on decomposer functions might be seen. A model is presented. It is suggested that monitoring of treatment plots and seeding generator silver gradients should be continued in order to extend the time scale over which the ecological effects can be predicted. (Mills-Arizona)
W76-02665

BENEFICIAL AND DETRIMENTAL EFFECTS OF RANGE IMPROVEMENT PRACTICES ON RUNOFF AND EROSION,
Utah State Univ., Logan. Coll. of Natural Resources; and Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4C.
W76-02671

THE HISTORICAL POTENTIAL OF SNOWFALL AS A WATER RESOURCE IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
B. M. Tunnicliff.
Master of Science Thesis, 1975, 137 p, 35 fig, 7 tab, 12 ref, 3 append.

Descriptors: *Snowfall, *Snowmelt, *Water supply, *Arizona, *Climatology, *Dendrochronology, Meteorology, Precipitation(Atmospheric), Hydrologic cycle, Snow surveys, Arid lands, Water resources development, Planning, Water utilization, Water resources, Potential water supply, Water requirements, Trees, Probability, Statistical methods.
Identifiers: San Francisco Mountains(Ariz), White Mountains(Ariz).

The state of Arizona, situated in an arid region, is using nearly all of its available ground and surface water resources to meet its domestic, industrial, and agricultural needs. In order to aid in the determination of snowmelt water resources, tree-ring chronologies from the San Francisco Mountains and White Mountains region of central Arizona were used to reconstruct past annual snowfall water equivalents for up to the last 500 years. Using these reconstructions, long-term means and variances of annual snowfall were calculated and short and long-term trends of snowfall were identified. Response functions were developed for the tree-ring chronologies to isolate those which were responding to snowfall. Chronologies responding to snowfall were calibrated with modern snowfall records and snowfall reconstructions were generated for the length of the chronologies with the calibration equations. most notable of long-term snowfall trends is the somewhat atypically stable mean snowfall water supply central Arizona has experienced since the 1920's. Periods of far less mean snowfall have occurred before then. in terms of surface water resources from snowmelt, central Arizona can expect periods of greater long-term snowfall variability than it has come to depend on in the last 40 years. (Robinett-Arizona)
W76-02675

CONTROLLED GENERATION OF LARGE VOLUMES OF ATMOSPHERIC CLOUDS IN A GROUND-BASED ENVIRONMENTAL CHAMBER,
National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center.
For primary bibliographic entry see Field 2B.
W76-02686

MULTIPLE USE EFFECTS OF MANIPULATING PINYON-JUNIPER,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 469-477, 5 fig, 2 tab, 5 ref.

Descriptors: *Pinyon pine trees, *Juniper trees, *Forest management, *Vegetation establishment, *Water yield improvement, Pine trees, Trees, Vegetation effects, Vegetation regrowth, Clear cutting, Herbicides, Cutting management, Canopy, Plant growth regulators, Water yield, Wildlife, Forages, Carrying capacity, Cost-benefit ratio, Planning, *Arizona.
Identifiers: Pinyon-Juniper stands, Overstory removal, Cabling, Beaver Creek watershed(Ariz).

Three different techniques of overstory removal--cabling, herbicide, and felling--were used in order to determine water yield improvement on the Beaver Creek watershed in the Coconino National Forest of Arizona. Results indicate that water yield is not improved by mechanical methods of pinyon-juniper removal but can be improved by herbicide removal of moderately dense to dense pinyon-juniper stands. Herbage yields increase after virtually all pinyon-juniper treatments, but due to differences in plant composition, potential livestock carrying capacity varies greatly. On the average the response by deer to these treatments is neutral. Projects which are successful in converting from a pinyon-juniper stand to a good stand of forage plants just about break even from a benefit-cost standpoint under 1972 conditions assumming no wood product sales are included. The author concludes that considerable planning and forethought should precede further pinyon-juniper conversion attempts as we must have a better understanding of how these different areas respond to different treatment techniques in terms of water yield, forage production, wood production, wildlife habitat, and in recreational and esthetic aspects. (Robinette-Arizona)
W76-02723

VARIABILITY OF INFILTRATION CHARACTERISTICS AND WATER YIELD OF A SEMI ARID CATCHMENT,
Arizona Univ. Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2G.
W76-02742

FREEZE-THAW EFFECTS ON SOILS TREATED FOR WATER REPELLENCY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2C.
W76-02743

DESCRIBING SNOWPACKS IN ARIZONA MIXED CONIFER FORESTS WITH A STORAGE-DURATION INDEX,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2C.
W76-02744

SNOWMELT RUNOFF EFFICIENCIES ON ARIZONA WATERSHEDS,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
For primary bibliographic entry see Field 2C.
W76-02866

CHARACTERIZATION OF SNOWMELT RUNOFF EFFICIENCIES,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.

For primary bibliographic entry see Field 2C.
W76-02871

EFFECT OF AN ASPHALT BARRIER ON WATER STORAGE AND DROUGHT PROBABILITY,
Minnesota Univ., St. Paul, Dept. of Soil Science.
J. P. Palta, and G. R. Blake.
Agronomy Journal, Vol 66, No 2, p 209-212, March-April, 1974. 3 fig, 2 tab, 7 ref. OWRT B-015-MINN(9).

Descriptors: *Water storage, Probability, *Asphalt, *Barriers, *Droughts, Drought resistance, Available water, Soil water, *Soil water movement, Moisture availability, Moisture stress, Water yield improvement.

Field measurements of water redistribution after infiltration were made on two sandy soils with and without asphalt barriers at a 55 cm depth to determine the barrier effect on soil water potential gradients and on water retention at various times. Estimates of the effect of the barrier on seasonal drought severity and on movement of water to horizons below the barrier were made on one of the soils. Soil water potential gradients and the volumetric water content at different depths were nearly the same for barrier and nonbarrier plots on Hubbard loamy coarse sand because a coarse sand-gravel layer between the 25 and 50-cm soil depths acts as a water barrier. After 96 hours drainage, suctions in Zimmerman fine sand reached 31 cm of water just above the barrier and 61 cm at the same depth without barrier. Available water to barrier depth was increased from 2.9 cm to 7.5 cm by the barrier. (Skogerboe-Colorado State)
W76-02872

3C. Use Of Water Of Impaired Quality

PERFORMANCE OF AUXILIARY BACTERICIDES IN PROCESS WATERS (PRESTAZIONE DEGLI AUSILIARI BATTERICIDI NELLE ACQUE DI FABBRICAZIONE),
Centro di Sperimentazione Cartotecnica, Milan (Italy).
M. Firpi.
Industria della Carta, Vol 13, No 6, p 247-249, June, 1975. 5 ref. 2 tab.

Descriptors: *Slime, *Bactericides, *Pulp and paper industry, Organic compounds, Sulfur compounds, Phenols, Halogens, Inhibitors, Water quality control.
Identifiers: Paper mills.

This review discusses the properties of various microbicides (chloro- and bromophenols, organic sulfur compounds, and organometallic compounds) in controlling slime formation in paper mills. Included is a brief report of studies on the action of a series of such antislime agents in the circulation system of a laboratory-scale paper machine. (Speckhard-IPC)
W76-02504

CHEMICAL RUN-OFF IN CATCHMENTS CONVERTED TO AGRICULTURAL USE,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Ecology Div.
For primary bibliographic entry see Field 5B.
W76-02528

SULFURIC ACID FOR REDUCING SODIUM HAZARD OF IRRIGATION WATER,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
G. S. Gumaa.
Master of Science Thesis, 1975, 36 p, 4 fig, 7 tab, 38 ref, 5 append.

Descriptors: *Irrigation water, *Water quality, *Saline water, *Sodium, *Acids, *Carbonates, Salinity, Salts, Sodium compounds, Acid-base equilibrium, Alkalinity, Hydrogen ion concentration, Neutralization, Water properties, Irrigation practices, Soil physical properties, Agriculture, Water management(Applied), Hydraulic conductivity, Infiltration, Hardness(Water), Adsorption.
Identifiers: *Sulfuric acid, Sodium adsorption ratio, Exchangeable sodium percentage.

Irrigation waters having a high sodium adsorption ratio cause adverse effects on soil physical properties as well as on plant growth. In this paper the effect of sulfuric acid added to irrigation water on the sodium adsorption ratio, exchangeable sodium percentage, and saturated hydraulic conductivity was studied. The experimentation used 5 soil samples and 5 different waters simulating those used for irrigation in the Southwestern U.S. The addition of sulfuric acid to the irrigation water decreased the sodium adsorption ratio and the exchangeable sodium percentage. From the results presented, the author concludes that conventional equations based on the pH sub c parameter overestimated the effect of bicarbonates on the sodium adsorption ratio, while the equation based on carbonate equilibrium gave a more realistic estimate. The measured exchangeable sodium percentage was proportional to the calculated sodium adsorption ratio. Acid application to irrigation waters (acid was applied in amounts sufficient to prevent Ca precipitation but with the pH remaining above 7 to prevent corrosion) may increase the rate of water movement when the sodium adsorption ratio is as low as 7.0 in some soils without lowering the pH to acid conditions. (Robinett-Arizona)
W76-02666

PHOSPHORUS SORPTION AND DESORPTION IN CALCAREOUS SOILS FROM ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2G.
W76-02677

WATER RESOURCES MANAGEMENT FOR PART OF THE LOWER GILA VALLEY,
Arizona Univ., Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 3F.
W76-02678

MANAGEMENT FOR THE CONTROL OF SALTS IN IRRIGATED SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. H. Fuller, and A. D. Halderman.
University of Arizona, College of Agriculture Bulletin A-43, 1975. 11 p, 8 fig, 2 append.

Descriptors: *Salts, *Saline soils, *Water quality, *Irrigation water, *Soil management, *Arid lands, Land reclamation, Alkaline soils, Salinity, Soil chemical properties, Salt tolerance, Farm management, Irrigation practices, Leaching, Soil-water-plant relationships, Soil physical properties, Agriculture, Root zone, Water management(Applied), Timing, Cultivation, Planting management, Rotations.

Permanent agriculture in arid and semiarid lands depends upon the control of salt in soils. Irrigation water and soil materials are the main sources of salts that may accumulate or concentrate in undesirable amounts within the root zone. This report is concerned primarily with basic principles and practices of water, soil, and crop management in irrigated lands to prevent harmful levels of salt accumulation, in addition to presenting concepts of management related to long-time irrigation and leaching of soils. Water management practices discussed include methods of irrigation and timing of irrigation for salt control, quality and quantity of water used for leaching, and salt movement in relation to water movement. Soil management practices discussed include tillage for improved infiltration, organic matter and crop residues, and crop-land selection. Cultural management practices are also discussed in relation to relative salt tolerances plants, seed placement, and crop selection and rotation. (Robinett-Arizona)
W76-02679

COMPOSITION AND CONCENTRATION OF SALTS IN SOIL SOLUTIONS OF THE MURGAB OASIS DESERT-MEADOW SOILS UNDER ANCIENT IRRIGATION, (IN RUSSIAN),
G. V. Vinogradova.
Probl Osvoeniya Pustyn'. 6: 38-44. 1975.

Descriptors: *Soils, *Deserts, Irrigation, Sulfates, *Sodium sulfate, *Saline soils, *Salinity, Chlorides, *Calcium carbonate, *Sodium chloride.
Identifiers: Murgab Desert, Magnesium sulfates, *USSR.

Calcium carbonates and sulfates are the principal components of salts of weakly concentrated soil solutions. High rates of sodium and magnesium sulfates are characteristic for moderately and highly concentrated solutions. The content of sodium chloride for all the concentrations of the solutions is from minimum (2.1 g/1) to maximum (97.9 g/1).--Copyright 1975, Biological Abstracts, Inc.
W76-02732

ECONOMIC ADJUSTMENT TO A NEW IRRIGATION WATER SOURCE: PINAL COUNTY, ARIZONA AND THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-02737

SALT BALANCE IN GROUNDWATER OF THE TULARE LAKE BASIN, CALIFORNIA,
For primary bibliographic entry see Field 4B.
W76-02751

SODIUM RELATIONS IN DESERT PLANTS: 4. SOME PHYSIOLOGICAL RESPONSES OF ATRIPLEX CONFERTIFOLIA TO DIFFERENT LEVELS OF SODIUM CHLORIDE,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
G. E. Kleinkopf, A. Wallace, and J. W. Cha.
Soil Sciences, Vol 120, No. 1, p 45-48, July, 1975. 1 fig, 3 tab, 22 ref.

Descriptors: *Plant physiology, *Desert plants, *Saline soils, *Salt tolerance, *Plant morphology, Plant growth, Plant tissues, Leaves, Sodium chloride, Arid lands, Semiarid climates, Alkaline soils, Salinity, Saline water, Salts, Chemical properties, Irrigation water, Crop production, Proteins, Transpiration, Water balance, Plant morphology, Nitrogen, Magnesium, Potassium, Phosphorus, Respiration, Water requirements, Water conservation.
Identifiers: Atriplex confertifolia(Torr Frem), Wats, Water use efficiency.

Atriplex species are characteristic of those facultative halophytes that are particularly adapted to arid and saline regions of the world. Because of their salt tolerance and high productivity, many of the Atriplex species could be used for plant establishment in saline areas or for increasing productivity in arid or semiarid regions. The purpose of this study was to determine some physiological and morphological changes of A. confertifolia to various salt levels in order to gain information on plant salt tolerance. Maximum yields were obtained with a 50 milliequivalent per liter NaCl treatment. Higher levels of salt produced large, succulent leaves showing nitrogen deficiency systems .Physiological effects of salt

noted were decreased chlorophyll, soluble protein and nitrate, and loss of nitrate reductase activity in addition to the reduction of the uptake of Mg, K, and P. Net carbon assimilation rates were reduced, presumably due to salt-induced increases in respiration. Leaf water potential was decreased greatly by salt level increase. At a leaf temperature of 20 C, transpiration levels were quite insensitive to salt levels, but at 30 C transpiration rates decreased with increasing salt indicating greater water use efficiency. (Robinett-Arizona)
W76-02968

3D. Conservation In Domestic and Municipal Use

METHOD AND APPARATUS FOR CONSERVING WATER,
For primary bibliographic entry see Field 5D.
W76-02607

WATER QUALITY MANAGEMENT PLANNING FOR URBAN RUNOFF,
URS Research Co., San Mato, Calif.
For primary bibliographic entry see Field 5D.
W76-02758

COMPUTING THE BIG PICTURE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, and J. W. Labadie.
Water and Wastes Engineering, Vol 12, No 5, p 37-39, May, 1975. 3 fig. OWRT C-4172(9028)(6).

Descriptors: *Automatic control, *Water supply, *Urban drainage, *Flood control, Cities, Sewers, Storms, Rainfall, Runoff, Water resources development.
Identifiers: Urban water systems, Waste water management.

The concept of a management information and control system (MICS) as applied to urban water facilities has been named a Metropolitan Water Intelligence System (MWIS). Urban water systems have three major functions: water supply, waste water management, and urban drainage and flood control. Automation of such systems, where feasible, may increase efficiency as well as solve water quality standards and economic and administrative problems. Levels of automation in the United States may be monitoring only, remote supervisory control, computer assisted operator control, or closed loop automatic control. Cities with various stages of automation are Santa Clara, California; Denver, Colorado; Atlanta, Georgia; Monroe County, New York; Seattle, Washington; and San Francisco, California. The effectiveness of any large-scale control approach depends upon: development of adequate models for predicting storm events in real time over an urban center; accurate rainfall-runoff and sewer transport models; reliable communication systems and data process; and effective feedback control whereby control may be updated as a storm changes, based on successive storm predition. Although very sophisticated hardware exists in electronics, computers, pneumatics, hydraulics, and measurement, control applications need to be improved to the level of their potential. (Kramer-FIRL)
W76-02874

ASCE URBAN WATER RESOURCES RESEARCH PROGRAM,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Program.
For primary bibliographic entry see Field 2A.
W76-02939

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-02961

3E. Conservation In Industry

AMMONIA AND HYDROGEN SULPHIDE RECOVERY.
For primary bibliographic entry see Field 5D.
W76-02580

REUSE SOUR WATER STRIPPER BOTTOMS,
Betz Lab., Inc., Trevose, Pa.
For primary bibliographic entry see Field 5D.
W76-02582

LIQUID WASTE INCINERATION BY BALFOUR/NITTETU SYSTEM SOLVES EFFLUENT PROBLEMS, CAN PAY FOR ITSELF OR EVEN TURN WASTE INTO PROFIT.
For primary bibliographic entry see Field 5E.
W76-02591

DEVELOPING A CORPORATE RESPONSE TO POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass. School of Business Administration.
For primary bibliographic entry see Field 5G.
W76-02613

ENERGY DEMAND AND ITS EFFECT ON THE ENVIRONMENT,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 6D.
W76-02621

REGIONAL RESPONSE THROUGH PORT DEVELOPMENT: AN ECONOMIC CASE STUDY ON THE MCCLELLAN-KERR ARKANSAS RIVER PROJECT,
Arkansas Univ., Fayetteville. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W76-02623

WASTE CONTROL FOR JOB PLATERS,
For primary bibliographic entry see Field 5D.
W76-02793

TRAILER-MOUNTED PILOT PLANTS FOR WATER CONSERVATION,
Gulf Research and Development Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W76-02800

HOW ABITIBI INSULATION BOARD MILL ACHIEVES ZERO EFFLUENT DISCHARGE.
Pulp and Paper, Vol 49, No 10, p 96-99, September, 1975, 1 fig.

Descriptors: *Pulp and paper industry, *Discharge(Water), *Water conservation, *Water reuse, Water pollution sources, Wastes, Industrial wastes, Florida, Water pollution control, Water quality control, Operating costs, Costs, Recirculated water, Water utilization, Impaired water use, Industrial water, Effluents, Wood wastes, Recycling, Closed conduits.
Identifiers: *Board mills, *Zero discharge, Insulation board, White water, Pulpwood.

Abitibi Corporation has reactivated a 125 ton/day board mill located in Blountstown, Florida, which utilizes low-cost wood-waste products as the raw material. Pulping and stock refining systems designed specifically to accommodate the relatively dry raw material and to attain zero discharge are outlined. Water is added to the digesters at the start of each cooking cycle, and steam is added as required. The water added comes mainly from the blow-bin drain-tank. Also, boiler blowdown water and some machine white water are added to the digesters; no fresh water is used. Dilution water in the refiner area comes mainly from the clean white tank which receives clarified effluent from one of two surge ponds, and the machine lean white water chest. Dry edge trim removed from the board is repulped in a hydropulper and recycled. Sawdust generated in cutting the final product is collected by a wet scrubber, the water overflow being sent to the hydrapulper. Dilution water for the hydrapulper and influent to the water scrubber comes from the machine lean white water chest. Water removed at the thickener is recirculated to the hydrapulper. Stock from the broke chest is diluted with lean white water and mixed with the refiner stock. Machine white water is again used for dilution of the stock passing to the stuff box. Other features of the closed water system are described. In general, the closed water system is comprised of a series of semiclosed loops within the system. Substantial operating cost reductions as well as compliance with water pollution standards have been achieved with the system. (Sykes-IPC)
W76-02947

RECOVERY OF SOLVENTS FOR THE PAINT AND ALLIED INDUSTRIES,
For primary bibliographic entry see Field 5D.
W76-02976

MODELS AND THE DECISION MAKING PROCESS: THE HUDSON RIVER POWER PLANT CASE,
Brookhaven National Lab., Upton, N.Y. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W76-02987

3F. Conservation In Agriculture

SPRINKLER WITH SEALED MAGNETIC ROTARY MOTION TRANSMITTING MECHANISM,
Nelson (L.R.) Corp., Peoria, Ill. (Assignee).
J. P. King.
U.S. Patent No 3,915,383, 5 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 1947, October 28, 1975.

Descriptors: *Patents, *Irrigation systems, *Sprinkler irrigation, Irrigation design, Irrigation efficiency, Gears, Mechanical equipment.
Identifiers: Reduction gears, Magnetic coupling, Movable sprinklers.

The use of a water flow responsive turbine in a sprinkler that is magnetically coupled to reduction gearing and drive means allows the reduction gearing to be completely, effectively, and reliable sealed from the water flow by a unitary housing without impairing the movement of the turbine. The use of such a unit in a sprinkler effectively seals the reduction gearing while not impairing turbine movement and also allows planetary reduction gears to be used. The use of planetary reduction gears in a sprinkler is advantageous because of their efficiency and because of their compactness and small size for a given reduction. The use of mechanical drive means powered by the output shaft from the planetary reduction gear unit operates both an oscillating linkage for a water delivery tube and drive wheels for the sprinkler unit as a whole to move it along the ground. Through the use of accessory reduction gearing and speed selecting means, the motor output shaft is able to power both such units. (Sinha-OEIS)
W76-02601

COMBINATION IRRIGATION AND TEMPERATURE CONTROL SYSTEM FOR PLANTS,
R. E. Diggs.
U.S. Patent No 3,915,384, 4 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 1948, October 28, 1975.

Descriptors: *Patents, *Irrigation systems, *Irrigation practices, *Sprinkler irrigation, *Mist irrigation, Irrigation efficiency, Irrigation effects, Temperature, Frost prevention, Evapotranspiration.

An apparatus is provided which can be used both to irrigate crops and to control the temperature during either hot or cold weather and which is economical in construction and use. A fitting is used which is connected at opposite ends to a source of air under pressure and to a conduit conveying water at low pressure. The water is caused to flow over the outer surface of the fitting, and the air is caused to flow into the fitting and thence outward through openings to intercept the water to produce either a fine mist or fog of water or a spray of larger droplets of water, depending upon the air pressure utilized. This irrigates the plants and prevents freezing of the plants. For example, the fine mist or fog of water vapor produces a blanket which prevents thermal radiation from plant and soil surfaces, and the larger the droplets collect on the leaf surfaces, whereby the latent heat used to convert the vapor on the leaf surfaces to liquid and from liquid to ice warms the leaves and thus prevents freezing. The system uses about 5 gallons of water per minute per acre. The apparatus can also be used to control the temperature of plants during how weather by producing a spray of water which collects on the leaf surfaces and is then evaporated, and the heat required to convert the liquid water to vapor cools the leaves. (Sinha-OEIS)
W76-02602

WATER RESOURCES MANAGEMENT FOR PART OF THE LOWER GILA VALLEY,
Arizona Univ., Tucson, Dept. of Watershed Management.
J. M. Filho.
Ph.D. Dissertation, 1974. 130 p, 4 fig, 25 tab, 55 ref, 1 append.

Descriptors: *Water management(Applied), *Drainage, *Arizona, *Saline water, *Irrigation practices, Flood control, Irrigation water, Groundwater, Water table, Irrigation effects, Colorado River, Mathematical models, Riparian plants, Sprinkler irrigation, Irrigated land, Flood irrigation.
Identifiers: Gila River(Ariz).

This study outlines past and present water management practices and problems in the Wellton-Mohawk Irrigation and Drainage District located in a valley along the Gila River in southwestern Arizona. Problems of the District include declining groundwater levels, salt accumulation, and drainage difficulties. Objectives of the study focus on better use of water resources, reduction of the risks of flood damage, and decreasing the salt content of water being diverted to Mexico. A mathematical model was developed to analyze the impact of selected management alternatives. A proposal to increase irrigated acreage and two strategies proposing reduction or elemination of riparian vegetation were judged impracticable. Increasing levels of change from flood to sprinkler irrigation (25, 50, and 100 percent) seemed a possible solution to area water problems and would substantially decrease the highly saline drainage flow into the Colorado River. Combinations of changes to sprinkler irrigation and reduction of riparian vegetation levels seemed to counteract each other in terms of drainage water to be pumped. Recommendations include restrictions on new irrigation development, some changes to sprinkler irrigation, and further studies and data collection. (Mills-Arizona)
W76-02678

AGRICULTURAL RUNOFF POLLUTES SURFACE WATERS, PART I,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-02694

BACTERIOLOGICAL QUALITY OF SURFACE RUNOFF FROM AGRICULTURAL LAND, PART II,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-02695

ACCURACY OF SOIL WATER BUDGETS BASED ON A RANGE OF RELATIONSHIPS FOR THE INFLUENCE OF SOIL WATER AVAILABILITY ON ACTUAL WATER USE,
University of New England, Armidale (Australia). Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-02715

AN ANALYSIS OF BORDER IRRIGATION FLOW,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
D. W. Fonken.
Ph.D. Dissertation, 1974. 131 p, 11 fig, 22 tab, 18 ref, append.

Descriptors: *Irrigation practices, *Border irrigation, *Irrigation engineering, *Mathematical studies, *Computer models, Irrigation, Irrigation systems, Furrow irrigation, Irrigation design, Water distribution(Applied), Infiltration, Dikes, Lateral conveyance structures, Flow, Soil water movement, Mass, Momentum equation, Mathematics, Mathematical models, Estimating equations, Computer programs.
Identifiers: Conservation of mass, Conservation of momemtum.

Border irrigation is defined by the author as the application of water to the soil by causing it to flow between parallel dikes across a sloping plane rectangular field. The dissertation describes an analysis of border irrigation flow beginning with field observations and proceeding through a mathematical analysis, to development of a mathematical model of border irrigation. The model, based on mathematical equations which satisfy the laws of conservation of mass and momentum, can predict depth and velocity of surface flow, and depth of infiltrated water at any point in a border when the slope, length, roughness, inflow rate and infiltration rate are specified. Numerical integration of the equation is accomplished by selecting finite quantities of time and space, small enough so that average numerical values can be used to represent the range of values actually occurring over the interval. Assumptions of surface shape and infiltration rate enable numerical approximation of the equations. Field run simulation validated the analysis and model with acceptable accuracy. The author poses that the model can be used by designers and operators of border irrigation systems, for classroom instruction, and could be adapted to borders with dikes across the lower end or to furrow irrigation techniques. (Michael-Arizona)
W76-02728

ECONOMIC ADJUSTMENT TO A NEW IRRIGATION WATER SOURCE: PINAL COUNTY, ARIZONA AND THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
M. A. Boster, and W. E. Martin.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 13-19, 2 tab, 7 ref. OWRT A-048-ARIZ(1).

Descriptors: *Irrigation, *Economics, *Agriculture, *Arizona, *Water delivery, Groundwater resources, Water management(Applied), Water supply, Acreage, Crop production, Salinity.
Identifiers: *Central Arizona Project, *Pinal County(Ariz).

Pinal County is one of Arizona's largest farm and highest farm income areas. Agriculture there is completely dependent upon irrigation systems, with nearly all of the water supply pumped from underlying groundwater reservoirs. Delivery of Central Arizona Project water will not assure groundwater conservation at a one to one trade-off ratio. Most of the monetary benefits to agriculture derived from the Project will be realized by Indian farmers. Cotton acreage will not be affected, but the acreage of small grains and alfalfa will increase. The increasing salinity of CAP water should be of no concern to Pinal County farmers. (McLachlan-Arizona)
W76-02737

A FIELD STUDY OF SOIL WATER DEPLETION PATTERNS IN PRESENCE OF GROWING SOYBEAN ROOTS: I. DETERMINATION OF HYDRAULIC PROPERTIES OF THE SOIL,
Minnesota Agricultural Experiment Station, St. Paul.
For primary bibliographic entry see Field 2G.
W76-02933

USE OF MAIN CANALS AND REGULATING RESERVOIRS OF IRRIGATION SYSTEMS FOR RURAL DRINKING WATER SUPPLY, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 4A.
W76-02951

WATER RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NEVADA, 1974-75,
Geological Survey, Las Vegas, Nev.
For primary bibliographic entry see Field 4B.
W76-02958

INFLUENCE OF WATER STRESS ON PARAMETERS ASSOCIATED WITH HERBAGE QUALITY OF PANICUM MAXIMUM VAR. TRICHOGLUME,
Commonwealth Scientific and Industrial Research Organizations, St. Lucia (Australia), Div. of Tropical Agronomy.
For primary bibliographic entry see Field 2I.
W76-02969

EMITTER FOR IRRIGATION SYSTEMS,
Harmony Emitter Co., Inc., Tucson, Ariz. (Assignee).
R. C. Harmony.
U.S. Patent No 3,917,169, 5 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 261, November 4, 1975.

Descriptors: *Patents, *Irrigation, *Distribution systems, *Irrigation systems, Irrigation efficiency, Irrigation design, Water control, Flow control.
Identifiers: *Emitters.

An irrigation system has an apertured water pipe for conveying a flow of water from a source of water under pressure to each aperture and an emitter placed at each aperture of discharging water from the water pipe to the area to be irrigated. The emmitter has: a water passageway for discharging water from an aperature in the water pipe to the soil to be irrigated; a pair of elements

for supporting the water passageway within the aperture of the water pipe, one of the pair of elements extending across one part of the aperture and the other extending across another part of the aperture, which edges, in combination, define the discharge orifice of the water passageway; bias means for constricting the water passageway in response to variations in water pressure within the water pipe; and means for establishing a pressure gradient within the water passageway as a function of the water pressure within the water pipe. The rate of water discharge through the emitter is maintained at a constant rate despite variations in water pressure within the water pipe. (Sinha-OEIS)
W76-02998

PROPELLING PIPE SUPPORT TOWER FOR PIVOT IRRIGATION SYSTEMS,
E. E. Reinke.
U.S. Patent No 3,917,171, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 262, November 4, 1975.

Descriptors: *Patents, *Irrigation, *Distribution systems, *Irrigation systems, Irrigation practices, Irrigation efficiency, Lateral conveyance structures, Equipment.

A drive system is provided for an irrigation pipe supporting tower which is capable of obtaining sufficient ground traction to drive the tower even when the tower is moving over soft ground surfaces. The drive mechanism is actuated by means of a simplified motor system wuch as a double-acting cylinder. Precise actuation of the drive means of a number of towers placed in aligned positions is carried out in order that the irrigation pipe may be maintained substantially straight. The irrigation pipe support tower is inverted V-shaped in configuration. The lower ends of the legs of the tower are equipped with ground-engaging skids and a forward power leg has its upper end engaged with the forward leg of the tower for movement. The lower end of the power leg can be projected downward and rearward relative to the tower. A double-acting hydraulic cylinder is connected between the upper apex portion of the tower and the power leg with suitable controls. The lower end of the poser leg is equipped with a large horizontal cross-sectional area foot for engagement with the ground. (Sinha-OEIS)
W76-02999

DRIP IRRIGATION METHOD,
Andco, Inc., Buffalo, N.Y. (Assignee).
R. W. Hildebrandt, and H. Hanks, Jr.
U.S. Patent No 3,917,166, 3 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 260, November 4, 1975.

Descriptors: *Patents, *Irrigation, *Surface irrigation, *Distribution systems, Irrigation practices, Irrigation systems, Irregation efficiency, Water control, Water distribution(Applied).
Identifiers: *Drip irrigation.

A drip irrigation emitter installation delivers equal amounts of water to a number of plant root areas regardless of line pressure variations. A supply of emitters of different flow potential for supplying the same given amount of water at various line pressures are provided. During installation, a predetermined head pressure and flow rate of water is maintained at the beginning of the feeder tube system and holes are successively formed in the tube where emitters are to be installed. Without regard to line pressure losses, the specific line pressure at each hole is measured and an emitter adapted to deliver the desired amount of water at such pressure is selected and installed at that location. (Sinha-OEIS)
W76-03000

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

CLEARCUTTING AND BURNING SLASH ALTER QUALITY OF STREAM WATER IN NORTHERN IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
G. G. Snyder, H. F. Haupt, and G. H. Belt, Jr.
U. S. Department of Agriculture, Forest Service, Research Paper INT-168, 34 p, June 1975, 26 fig, 20 ref, 5 tab.

Descriptors: *Watershed management, *Idaho, *Clear-cutting, *Burning, *Wood wastes, *Lumbering, *Water quality, *Streams, Surface waters, Rocky Mountain Region, Physical properties, Nutrients, Water properties, Electrical conductance, Bicarbonates, Sulfates, Calcium, Magnesium, Hydrogen ion concentration, Turbidity, Suspended solids, Potassium, Sodium, Chlorides, Drainage patterns(Geologic), Water pollution sources.
Identifiers: Priest River Experimental Forest(Idaho).

Three cutting units of varying size, soil, and aspect located along streams in the Priest River Experimental Forest in northern Idaho were chosen for evaluation of changes in water quality caused by clearcutting and subsequent burning of slash. Water sampling stations were established on each creek, upstream, downstream, and at clear-cut/burned areas. Except for on-site stations, buffer strips of natural vegetation were left along channels to minimize the efects of treatment. Physical and nutrient comparisons between the upstream and downstream stations showed slight increases in electrical conductivity, bicarbonate, sulfate, calcium, and magnesium. Similar comparisons between upstream and the on-site stations revealed increases in pH, electrical conductivity, turbidity, suspended solids, bicarbonate, sulfate, potassium, calcium, and magnesium. Nutrients that did not indicate increases for buffer strip comparisons were chloride and sodium. In general, larger increases were observed at the on-site stations except for one station with a different drainage pattern. (Witt-IPC)
W76-02522

CONVERSION OF CHAPARRAL TO GRASS IN CENTRAL ARIZONA: EFFECTS ON SELECTED IONS IN WATERSHED RUNOFF,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5B.
W76-02527

METHOD AND APPARATUS FOR CONTROLLING WATER FLOW FROM AN IMPOUNDED BODY OF WATER,
Fluid Dynamics Proprietory Ltd., Cape Town (South Africa).
L. A. Turner, and R. Peter.
U.S. Patent No 3,913,334, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1190, October 21, 1975.

Descriptors: *Patents, *Water control, *Flow control, *Regulated flow, *Water conveyance, Barriers, Reservoir releases, Floats, Engineering structures.

The invention provides a method of controlling the rate of flow of water from an impounded body of water (reservoir or canal), in which the water is caused to flow beneath a barrier apparatus or float. The lower part of the float is of curved configuration so that as water flows past it, it tends to act as an aerofoil. The direction of curvature of the lower part being such that the upward pressure on the underside of the float decreases with increasing rate of water flow and increases with decreasing rate of water flow. As the rate of flow depends on the difference between the water level upstream of the float and the level downstream of the float, the effect of the change of static pressure on the float is to close the barrier as the upstream level increases and open the barrier as the upstream level drops, thereby to obtain a substantially constant downstream level. It is desirable for the floor beneath the float to slope upwardly so that with the curved part of the float it effectively defines a venturi giving the optimum flow pattern. (Sinha-OEIS)
W76-02595

REGIONAL RESPONSE THROUGH PORT DEVELOPMENT: AN ECONOMIC CASE STUDY ON THE MCCLELLAN-KERR ARKANSAS RIVER PROJECT,
Arkansas Univ., Fayetteville. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W76-02623

NATURAL DISASTERS: SOME EMPIRICAL AND ECONOMIC CONSIDERATIONS,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 6C.
W76-02625

LOWER SHEYENNE RIVER BASIN WATER - LAND - PEOPLE.
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 5A.
W76-02627

SOCIAL EFFECTS OF CHANGES IN USES OF BEAR LAKE, AN INTERSTATE BODY OF WATER,
Utah State Univ., Logan. Inst. for Social Science Research.
For primary bibliographic entry see Field 6B.
W76-02634

GROUNDWATER SEEPAGE AND ITS EFFECT ON SALINE SOILS,
Montana Environmental Quality Council, Helena.
For primary bibliographic entry see Field 2G.
W76-02639

CONFERENCE ON THE MANAGEMENT OF RECREATIONAL LAKES.
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 6B.
W76-02641

AQUATIC VEGETATION HARVESTING,
Dane County Dept. of Public Works, Madison, Wis.
H. Hartwig, and A. Woerpel.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972. Wisconsin University Center, Marinette County, p 47-49.

Descriptors: *Recreation, *Aquatic weed control, *Harvesting, Lakes, Rivers, *Wisconsin, Equipment, Capital costs, Operating costs.
Identifiers: Lake Mendota(Wis), Lake Monona(Wis), Lake Waubesa(Wis), Lake Kegonsa(Wis), Yahara River(Wis), Madison(Wis).

The aquatic vegetation harvesting program in the Madison, Wisconsin lakes and the Yahara River is described. The watershed runoff is rich in nutrients, thus a program of holding effluents in

manure pits and grass waterways has been started. The overall effectiveness of the program is as yet undetermined. Weeds are cut by harvesters and transferred by conveyors to trucks which transport them to landfills. Approximately 1 acre/hour is harvested; plant density does not change this rate. A strip 150 feet wide from the pier line is cut, plus laterals to open water about every 500 feet when necessary. Water accounts for much of the transported load, so methods to reduce this 50-90% (by chopping, squeezing, or dewatering) are being studied. The 100-day operation begins in May. Underwater obstacles, weather, and mechanical difficulties pose problems. One permanent employee serves as supervisor and mechanic; other employees are seasonal. Dane County has a $200,000 capital outlay for equipment. In 1971, 3,500 acres were harvested for less than $35,000 operational costs. The Dane county 1972 weedcutting budget was $49,900 for capital outlay and$44,705 for labor, fuel, equipment, and repairs at a cost of 30.8 cents/person. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02647

AN ENVIRONMENTAL LAND PLANNING APPROACH--CASE STUDY, LILY LAKE PROJECT,
Wisconsin Univ., Madison. Environmental Awareness Center.
For primary bibliographic entry see Field 6B.
W76-02649

COOPERATION WITH THE SOIL CONSERVATION SERVICE,
Soil Conservation Service, Antigo, Wis. Resource Conservation and Development.
For primary bibliographic entry see Field 6E.
W76-02650

WATER RESOURCES DATA FOR NEBRASKA, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 7C.
W76-02656

LEGAL-POLITICAL HISTORY OF WATER RESOURCE DEVELOPMENT IN THE UPPER COLORADO RIVER BASIN,
California Univ., Santa Barbara. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W76-02669

INFILTRATION CONTROL THROUGH SOIL SURFACE MANAGEMENT,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2G.
W76-02673

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1973.
Australian Water Resources Council Canberra.
For primary bibliographic entry see Field 2A.
W76-02680

THE LOG PEARSON TYPE 3 DISTRIBUTION AND ITS APPLICATION IN HYDROLOGY,
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2E.
W76-02701

STUDY OF TIME-LAPSE PROCESSING FOR DYNAMIC HYDROLOGIC CONDITIONS,
Stanford Research Inst., Menlo Park, Calif.
S. M. Serebreny, W. E. Evans, and E. J. Wiegman.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-16068, $5.50 in paper copy, $2.25 in microfiche. Final report, prepared for Goddard Space Flight Center, Greenbelt, Ma., November 1974. 107 p, 29 fig, 4 tab.

Descriptors: *Hydrology, Monitoring, Measurement, Water, Snow, Vegetation, Lakes, Watersheds(Basins), Abstracts, *Data processing.
Identifiers: *ERTS Imagery, *Dynamic display, Multi-spectral analysis, Time-lapse.

The objective of this research was to investigate the usefulness of dynamic display techniques in exploiting the repetitive nature of ERTS imagery. A specially designed Electronic Satellite Image Analysis Console (ESIAC) has been developed and employed to process data for seven ERTS principal investigators studying dynamic hydrological conditions for diverse applications. These applications include measurement of snowfield extent and sediment plumes from estuary discharge, playa lake inventory, and monitoring of phreatophyte and other vegetation changes. The ESIAC providing facilities for storing registered image sequences in a magnetic video disc memory for subsequent recall, enhancement, and animated display in monochrome or color. The most unique feature of the system is the capability to time-lapse the imagery and analytic displays of the imagery. Data products have included quantitative measurements of distances and areas, binary thematic maps based on monospectral or multispectral decisions, radiance profiles, and movie loops. Applications of animation for uses other than creating time-lapse sequences are identified. Input to the ESIAC can be either digital or via photographic transparencies. Most of the project work was with transparencies for reasons of convenience, cost, and speed. (Bell-Cornell)
W76-02713

EVALUATING COSTS FOR PORT DISTRIBUTION SYSTEMS,
Board of Engineers for Rivers and Harbors, Washington, D.C.
R. G. Waugh, Jr.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 101, No WW4, Proceedings paper No 11723, p 385-392, November 1975.

Descriptors: *Harbors, *Costs, *Evaluation, Ports, Economics, Transportation, Forecasting, Planning, Constraints, Storage.
Identifiers: *Waterways(Transportation), *Economic analysis, Commodity movements, Economic data, Energy crisis.

Planning port and inland distribution systems necessitates the investigation of highly complex systems for which manageable solutions must be found; often the tools of analysis may not be readily available. Significant steps of analysis should include: (1) proper identification of the relevant system and alternatives; (2) compilation of meaningful data on transportation flows and costs for alternative modes with due qualification of such data's utility; (3) recognition of constraints on system capacity; and (4) evaluation of the significance of time and quality of service in transportation alternatives. To evaluate alternative modes for distributing commodities to markets, the relevant distribution system must be identified. The basis for choice between modes for a specific commodity movement will be based on total system costs, including line-haul transport, transfer and storage, and such items as the value of time in transit. Systems evaluation should also consider transport capacity and competitive sources of commodity supply to serve the market under study. For specific movements, suitable data on commodity flows and transportation costs will generally not be available to most investigators. Recognizing that most traffic moves on the basis of current rates, not costs, modeling of transportation distribution systems will be imperfect. Problems in identifying system components and satisfying data requirements are examined. (Bell-Cornell)
W76-02716

ANALYSIS AND MANAGEMENT OF WATER DISTRIBUTION SYSTEMS,
National Inst. of Scientific Research, Quebec.
H. Demard, B. Bobee, and J-P. Villeneuve.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol 101, No UP2, Proceedings paper No 11679, p 167-182, November 1975. 5 fig, 3 tab, 3 equ, 36 ref.

Descriptors: *Water distribution(Applied), *Planning, *Design, *Management, Control, Networks, Operations, Pricing, Water demand, Assessment, Equations, Canada.
Identifiers: *Urban development, *Water consumption, Residences, Balancing techniques.

An integral approach to the management of urban water distribution systems is described, having as its objective the synthesis of the following elements: the planning, design, operation and control of the network, and the pricing of the resulting service. Analysis of the problem necessitates the use at various levels of different balancing techniques and suggests the need for data concerning the structure of the consumer demand (in time and space) for individual consumers and for defined user groups. Accordingly, a study has been made of the variations of consumer demand, on a time scale varying from 1 min. to 1 day, in representative single family and multiple family dwellings in two cities, Sherbrooke and Sainte-Foy (Province of Quebec, Canada). For the latter municipality, a study of the possible control of the water distribution system in real time, as a function of predicted consumer demand is described. Finally, a pricing structure based on the observed variations of the consumer demand is proposed.
W76-02718

MULTIOBJECTIVE PLANNING OF WATER AND LAND RESOURCES,
For primary bibliographic entry see Field 6B.
W76-02721

PREDICTING SPRING STREAMFLOW IN CENTRAL ARIZONA,
Oregon State Univ., Corvallis. School of Forestry.
R. L. Beschta, and D. B. Thorud.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 715-727, 3 fig, 2 tab, 8 ref.

Descriptors: *Streamflow forecasting, *Snowmelt, *Runoff, Precipitation(Atmospheric), *Synthetic hydrology, *Simulation analysis, *Arizona, Floods, Hydrographs, Streamflow, Runoff forecasting, Snowpacks, Water equivalent, Water yield, Recession curves, Soil moisture, Rainfall, Storms, Semiarid climates, River forecasting, River basins, Hydrologic data, Model studies, Rainfall-runoff relationships.
Identifiers: *Salt River Basin(Ariz), Recession analysis, Streamflow synthesis, Streamflow synthesis and reservoir regulations model.

This study consideres two alternative methods of forecasting future runoff in the 4,306 square mile Salt River Basin in central Arizona: (1) recession analysis and (2) streamflow synthesis. The recession analysis attempts to evaluate the memory or history of flow patterns on the basin whereas streamflow synthesis attempts to simulate hydrologic processes, particularly those affecting snowpact ablation, and changes in soil moisture storage. Under conditions where the recession coefficient (K sub r) associated with a rainfall event is low (during the late fall months when soil moisture is low), the recession analysis has limited

predictive capability. However, during the late winter or spring months, soil moisture levels are typically higher and the predictive capability is improved. In using the streamflow synthesis and reservoir regulation model, the magnitude of the predicted flow is related primarily to the existing snowpact water equivalent and soil moisture conditions on the prediction date. With no snow on the basin, use of this model offers no improvement over recession predictions, but as snow storage increases, the predictive capabilities using a simulation model are enhanced. Estimated flows using the simulation model were generally 2.5 to 3 times higher than those obtained by recession analysis. Because both methods did not utilize estimates of precipitation after the forecast date, they provided conservative predictions of expected flow volumes. (Robinett-Ariz)
W76-02724

IMPROVED STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMAL RESERVOIR OPERATION BASED ON THE ASYMPTOTIC CONVERGENCE OF BENEFIT DIFFERENCES,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. Guitron de los Reyes.
M. S. Thesis, 1974, 58 p, 8 fig, 4 tab, 18 ref, 2 append.

Descriptors: *Stochastic processes, *Mathematical studies, *Computer programs, *Dynamic programming, *Reservoirs, Markov processes, Model studies, Linear programming, Statistical models, Inflow, Streamflow, Operations, Equations, Operations research.

A new interative scheme is presented for stochastic dynamic programming which is more efficient than the conventional stochastic dynamic approach for calculating optimal operating rates for a single reservoir system. The scheme presented is composed of the conventional programming procedure alternated with iterations over a fixed policy to increase the chance of finding the optimal policy more rapidly. The thesis introduces a refined technique for deriving transition probability matrices and the use of bounded variables in the recursive equation thereby providing a simpler way to verify convergence of the cyclic gain of the system. A computer program capable of implementing the new iterative scheme is presented in the appendices, and results of real application are presented to derive quantitative comparisons. The new iterative scheme is shown to save 25 percent of the computational time required with the conventional procedure. (Michael-Arizona)
W76-02729

STREAMFLOW HYDROLOGY AND SIMULATION OF THE SALT RIVER BASIN IN CENTRAL ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
R. L. Beschta.
Ph.D. Dissertation, 1974, 140 p, 33 fig, 7 tab, 57 ref, 4 append.

Descriptors: *Streamflow forecasting, *Simulation analysis, *Snowmelt, *Runoff, *Precipitation(Atmospheric), *Arizona, Synthetic hydrology, Floods, Hydrographs, Streamflow, Runoff forecasting, Snow, Water equivalent, Water yield, Recession curves, Soil moisture, Rainfall, Semiarid climates, River forecasting, River basins, Hydrologic data, Model studies, Rainfall-runoff relationships.
Identifiers: *Salt River Basin(Ariz), Salt River(Ariz), Streamflow synthesis and reservoir regulation model.

The unpredictable nature of precipitation and resultant runoff in arid and semi-arid regions has often limited the development and use of surface water resources. In the case of the Salt River, streamflow resulting from winter precipitation generally occurs at a time of year when reservoir withdrawals are at a minimum and, during years of above average carry-over storage and high runoff, the probability of releases and spills increases. In order to study winter streamflow from the Salt River Basin, a continuous simulation streamflow model was evaluated and used. Simulated hydrographs of the streamflow synthesis and reservoir regulation model generally underestimated peak flows and overestimated recession flows following major rainfall events. The standard error of the estimate for simulated winter flows (November through May) was 30,000 acre-feet for the calibration period but increased to approximately 120,000 acre-feet for the validation period. About 25 to 45 percent of the winter runoff occurring after February 1, March 1 and April 1 could be predicted from simulated snowpack water equivalent and soil moisture conditions on the prediction date. For a selected winter period, simulations indicated streamflow response to a one-inch change in winter precipitation would be approximately 100,000 acre-feet, or 3.4 times greater than expected from a one-degree change in winter temperature. (Robinette-Arizona)
W76-02731

STATE WATER PLANNING,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6E.
W76-02735

THE GEOMORPHIC AND HYDRAULIC RESPONSE OF RIVERS,
Colorado State Univ., Fort Collins. Coll. of Engineering.
For primary bibliographic entry see Field 2E.
W76-02738

DESCRIBING SNOWPACKS IN ARIZONA MIXED CONIFER FORESTS WITH A STORAGE-DURATION INDEX,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2C.
W76-02744

FILTRATION OF DRAINAGE ELEMENT,
A. G. Bayer.
Belgian Patent 802,943, Applied July 30, 1973, Issued January 30, 1974. Derwent Belgian Patents, Vol 5, No 7, March, 1974.

Descriptors: *Filtration, *Drainage systems, *Groundwater, *Surface water, Fabrics, *Patents.

A filtration or drainage system for ground and surface water around foundations and in embankments is described. It consists of two mutually parallel textile articles of large surface formed from synthetic or other rot resistant fibers with a water discharge zone between them. (Merritt-FIRL)
W76-02838

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 4C.
W76-02865

SNOWMELT RUNOFF EFFICIENCIES ON ARIZONA WATERSHEDS,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
For primary bibliographic entry see Field 2C.
W76-02866

CHARACTERIZATION OF SNOWMELT RUNOFF EFFICIENCIES,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
For primary bibliographic entry see Field 2C.
W76-02871

COMPUTING THE BIG PICTURE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W76-02874

DEVELOPMENT OF REGIONAL SUPPLY FUNCTIONS AND A LEAST-COST MODEL FOR ALLOCATING WATER RESOURCES IN UTAH: A PARAMETRIC LINEAR PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W76-02876

FORMULATION OF NONSTRUCTURAL FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W76-02879

RESERVOIR PROJECT ENVIRONMENTAL STUDY,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 6B.
W76-02880

A STUDY OF MINNESOTA FORESTS AND LAKES USING DATA FROM EARTH RESOURCES TECHNOLOGY SATELLITES, TWENTY-FOUR MONTH PROGRESS REPORT.
Minnesota Univ., Minneapolis. Space Sciences Center.
Available from the National Technical Information Service, Springfield, Va. 22161, as N75-12421, $7.50 in paper copy, $2.25 in microfiche. Twenty-four Month Progress Report, June 30, 1974. 240 p. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Minnesota, *Lake Superior, *Hydrology, *Satellites(Artificial), Water quality, Forest management, Watersheds(Basins), Vegetation, Snowmelt, Currents(Water), Lakes, Turbidity, Saline soils, Classification, Flood forecasting.
Identifiers: *ERTS, *Forest disease detection, *Red River Valley(Minn).

Research activities for the second year of the Remote Sensing Program were reviewed. Titles of the twelve reports presented were: Forest Disease Detection and Control; Evaluation of Water Quality by Remote Sensing Techniques; Forest Vegetation Classification and Management; Detecting Saline Soils in the Red River Valley, Minnesota, by Remote Sensing Techniques; Use of ERTS Imagery to Assist in Snowmelt Flood Prediction; Remote Sensing Applications to Hydrology in Minnesota; Rice Creek Watershed Project; Management of Hydrologic Features in West Central Minnesota from ERTS-1 Imagery; Remote Sensing in Lake Superior Studies; Remote Sensing in Western Lake Superior; Use of ERTS in Measurements of Water Quality in Lake Superior and the Duluth Superior Harbor; and Determination of Lake Superior Currents from Turbidity Patterns Observed from ERTS. (See W76-02902 thru W76-02908) (Humphreys-ISWS)
W76-02901

FOREST DISEASE DETECTION AND CONTROL,
Minnesota Univ., St. Paul. Dept. of Plant Pathology.
For primary bibliographic entry see Field 2I.
W76-02902

EVAULATION OF WATER QUALITY BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., St. Paul. Dept. of Forest Biology.
For primary bibliographic entry see Field 5A.
W76-02903

FOREST VEGETATION CLASSIFICATION AND MANAGEMENT,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
M. P. Meyer.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Centter, p 39-52, June 30, 1974. 3 fig, 1 tab, 2 ref. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Aerial photography, *Forests, *Minnesota, Management, Forest management, Project planning, Costs, Economics, Efficiencies, Vegetation, Classifications, Surveys, Data collections.

Representatives of the Minnesota Department of Natural Resources, the College of Forestry, Minnesota's forest industries, land commissioners of the forested counties and the U.S. Forest Service have cooperated over a period of years in developing a comprehensive plan for precurement of continuing, high quality, aerial photography of Minnesota's forests. This plan was recently approved by the Minnesota State Legislature and funded for its first biennium of operation. To insure quality coverage, the College of Forestry drafted the basic contact specifications and established a system of materials inspection. To test the possible future use of smaller photo scales (1:24,000 or 1:31,680), and thereby realize further economies of purchase and interpretation, sample test sites will be flown concurrently with the 1:15,840 current coverage in Mahnomen, Lake of the Woods, and Becker Counties in 1974. Upon completion of these overflights, local user-cooperators will compare the relative applicability of the smaller scales of coverage in lieu of the conventional (1:15,840) coverage (See also W76-02901) (Sims-ISWS)
W76-02904

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-02905

USE OF ERTS IMAGERY TO ASSIST IN SNOWMELT FLOOD PREDICTION,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 2C.
W76-02906

REMOTE SENSING APPLICATIONS TO HYDROLOGY IN MINNESOTA,
Minnesota Univ., Minneapolis, Dept. of Geography.
D. Brown, and R. Skaggs.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 81-196, June 30, 1974. 3 fig, 35 ref, 2 append. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Aerial photography, *Satellites(Artificial), *Minnesota, Runoff, Watersheds(Basins), Surface waters, Mapping, Wetlands, Urban hydrology, Water quality, Lakes, Seasonal, Surveys, Hydrology.
Identifiers: *ERTS.

Two years efforts have been directed toward the application of satellite and high altitude photographic imagery to a variety of hydrologic problems. The studies included: (1) the investigation of surface cover data to develop surface runoff coefficients for noninstrumented watersheds, described in the appended Rice Creek Watershed Project final report; (2) the detection of surface water and seasonal surface water changes with ERTS imagery, reported in the appended MA thesis; (3) the application of ERTS-1 MSS imagery to the detection of Peaty Wetlands; (4) the application of high altitude aerial photography and manually interpreted and density sliced ERTS-1 images to the development of an urban hydrologic model for the Twin Cities Metropolitan Area; and (5) the investigation of multi-seasonal ERTS-1 imagery for classification of lake quality in Minnesota. (See also W76-02901) (Sims-ISWS)
W76-02907

REMOTE SENSING IN LAKE SUPERIOR STUDIES,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2H.
W76-02908

A STOCHASTIC RAINFALL MODEL AND STATISTICAL ANALYSIS OF HYDROLOGIC FACTORS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-02928

GEOMORPHIC PROCESSES ACTIVE IN THE SOUTHWESTERN LOUISIANA CANAL, LAFOURCHE PARISH, LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 2J.
W76-02930

TRANSIENT FLOW ROUTING IN CHANNEL NETWORKS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 8B.
W76-02941

REMOVAL OF PERIODICITIES BY DIFFERENCING AND MONTHLY MEAN SUBTRACTION,
Purdue Univ., Lafayette, Ind. Schools of Engineering.
For primary bibliographic entry see Field 2A.
W76-02944

USE OF MAIN CANALS AND REGULATING RESERVOIRS OF IRRIGATION SYSTEMS FOR RURAL DRINKING WATER SUPPLY, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. V. Tsapko, G. I. Meleshko, and L. N. Vanyurikhina.
Gig Sanit, 9, 91-92, 1974.

Descriptors: *Water supply, Potable water, *Irrigation systems, Canals, *Irrigation canals, *Reservoir operation, Biochemical oxygen demand, Oxidation, Water quality, Algae, Water sources, Cattle, Regulation.
Identifiers: Ukrainian-SSR, *USSR.

In some irrigation systems in the S Ukrainian SSR (USSR), the transparency of the water in the main canals increased and the oxidizability and biochemical oxygen demand decreased. Water quality improved even more in the regulating reservoirs, which were natural settling tanks. Water quality degradation was noted in the canals and reservoirs only at places of unorganized bathing and water of cattle. The canals had no algal growth due to their considerable depth and fast current. Canals and reservoirs are thus suitable as water sources for rural water mains.--Copyright 1975, Biological Abstracts, Inc.
W76-02951

ON THE VALUE OF INFORMATION TO FLOOD FREQUENCY ANALYSIS,
Geological Survey, Reston, Va.
J. R. Slack, J. R. Wallis, and N. C. Matalas.
Water Resources Research, Vol 11, No 5, p 629-647, October 1975. 11 tab, 4 ref.

Descriptors: *Flood frequency, *Mathematical models, *Stochastic processes, *Monte Carlo method, *Synthetic hydrology, Evaluation, Statistical methods, Time series analysis, Simulation analysis, Streamflow, Optimum development plans, Design flood, Cost-benefit analysis.
Identifiers: *Water resources planning.

A set of Monte Carlo experiments was carried out to assess the sensitivity of the design losses associated with flood damage reduction measures to the following factors: the underlying distribution of floods, the assumed distribution of floods, the skewness of floods, the length of observed flood sequences, the design return period, the measure of shape of the loss functions, and the measure of relative scale of the over-design loss functions. On the basis of Monte Carlo experiments, the use of the normal distribution to represent the distribution of floods is generally better than either the Gumbel, log normal, or Weibull distributions. (Woodard-USGS)
W76-02952

LOW STREAMFLOW CHARACTERISTICS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-02955

THE EFFECT OF SURFACE DRAINAGE AND SUBSEQUENT STAND CUTTING ON CHANGES OF THE GRASS-MOSS COVER, (IN RUSSIAN),
For primary bibliographic entry see Field 2I.
W76-02956

THE BLACK HILLS-RAPID CITY FLOOD OF JUNE 9-10, 1972: A DESCRIPTION OF THE STORM AND FLOOD,
National Weather Service, Silver Spring, Md; and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-02967

4B. Groundwater Management

A REVIEW OF THE POTENTIAL APPLICATIONS OF REMOTE SENSING TECHNIQUES TO HYDROGEOLOGICAL STUDIES IN AUSTRALIA,
Newcastle Univ. (Australia). Dept. of Physics.
For primary bibliographic entry see Field 7B.
W76-02534

HAMMER SEISMIC TIMING AS A TOOL FOR ARTIFICIAL RECHARGE SITE LOCATION,
Agricultural Research Service, Fresno, Calif. Water Managment Research.
W. C. Bianchi, and H. I. Nightingale.

Soil Science Society of America Proceedings, Vol 39, No 4, p 747-751, July-August 1975. 4 fig, 4 tab, 14 ref.

Descriptors: *Seismology, *On-site investigations, *Groundwater, *Artificial recharge, *Water spreading, *California, Seismic properties, Seismic waves, Travel time, Seismic studies, Alluvial aquifers, Aquifers, Geophysics, Exploration, Equipment, Groundwater recharge, Recharge ponds, Sites.
Identifiers: *Leaky Acres recharge area(Calif), *Hammer seismic timing, *Alluvial geology, *Site selection.

Hand-carried hammer impact seismic timing equipment utilizes the physics of seismic wave refraction to explore stratigraphic changes deeper than those found on soils maps. In alluvial areas, artificial recharge and liquid waste disposal sites were selected from sandy, single-grained soil series noted for their high water-transmitting properties through the surface 2m. The surface horizon sesmic velocity exhibited by these soils in the San Joaquin Valley had a very narrow range (V sub 1 = 315-440 m/sec), which gave good definition to the refraction off the second horizon (V sub 2 = 610-2,100 m/sec). Accurate information on depth and horizontal continuity of this second horizon could be obtained in areal surveys. A third horizon may often be described, but its areal continuity is usually masked by intermediate discontinuous layers above it of equal or lesser refractivity. All these horizons are of hydraulic significance for groundwater recharge by water spreading. (Prickett-ISWS)
W76-02556

THE STUDY OF GROUND WATER MOVEMENT IN SELECTED AREAS OF NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W76-02628

GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 2. AN EVALUATION OF THERMAL WATER IN THE BRUNEAU-GRAND VIEW AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, Idaho.
H. W. Young, R. L. Whitehead, D. B. Hoover, and C. L. Tippens.
Idaho Department of Water Resources, Boise, Water Information Bulletin No 30, July 1975. 126 p, 11 fig, 5 tab, 30 ref, 2 append.

Descriptors: *Geothermal studies, *Thermal water, *Chemical analysis, *Water temperature, *Idaho, Geology, Water types, Sampling, Data collections, Geochemistry, Aquifer characteristics.
Identifiers: *Bruneau-Grand View(Idaho).

The Bruneau-Grand View area occupies about 1,100 sq mi in southwest Idaho and is on the southern flank of the large depression (possibly a graben) containing the western Snake River Plain. The igneous and sedimentary rocks range in age from Late Cretaceous to Holocene. They are transected by a prominent system of north-west-trending faults. The aquifers have been separated into two broad units: (1) the volcanic-rock aquifers, and (2) the overlying sedimentary-rock aquifers. The Idavada Volcanics or underlying rock units probably constitute the reservoir that contains thermal water. An audio-magnetotelluric survey indicated that a large conductive zone having apparent resistivities approaching 2 ohm-metres underlies a part of the area at a relatively shallow depth. Chemical analysis of 94 water samples collected in 1973 show that the thermal waters are of a sodium bicarbonate type. Although dissolved-solids concentrations of water ranged form 181 to 1,1000 mg/litre in the volcanic-rock aquifers, they were generally less than 500 mg/litre. Measured chloride concentrations of water in the volcanic-rock aquifers were less than 20 mg/litre. Temperatures of water from wells and springs ranged from 9.5 deg to 83.0 deg C. Temperatures of water from the volcanic-rock aquifers ranged from 40.0 deg to 83.0 deg C, whereas temperatures of water from the sedimentary-rock aquifers seldom exceeded 35 deg C. Aquifer temperatures at depth, as estimated by silica and sodium-potassium-calcium geochemical thermometers, probably do not exceed 150 deg C. However, a mixed-water geochemical thermometer indicates that temperatures at depth may exceed 180 deg C. The gas in water from the volcanic-rock aquifers is composed chiefly of atmospheric oxygen and nitrogen. Methane gas was also found in some water from the sedimentary-rock aquifers. The thermal waters are believed to be heated by deep circulation in a zone of high geothermal gradient resulting from thinning of the earth's crust. (See also W75-10147) (Woodard-USGS)
W76-02655

WATER RESOURCES DATA FOR NEBRASKA, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 7C.
W76-02656

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1973.
Australian Water Resources Council Canberra.
For primary bibliographic entry see Field 2A.
W76-02680

STIMULATION OF GEOTHERMAL AQUIFERS,
Stanford Univ., Calif. Dept. of Civil Engineering.
P. Kruger, and H. J. Ramey, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 054, $5.00 in paper copy, $2.25 in microfiche. Report No NSF-RA-N-73-105, March 1973. 91 p, 8 fig, 7 tab, 55 ref, 1 append. NSF GI-34925.

Descriptors: *Geothermal studies, *Model studies, *Explosions, *Environmental effects, Thermal water, Heat flow, Aquifers, Computer models, Mathematical models, Heat transfer, Porous media, Thermal conductivity, Nuclear explosions, Flow, Groundwater, Water quality, Energy, Underground.
Identifiers: *Geothermal aquifers, *Stimulation, Explosion-produced chimney, Two-phase flow, In-place boiling, Flash fronts.

The three major objectives of the program were: (1) development of experimental and numerical data to evaluate the optimum performance of explosion-stimulated geothermal aquifers; (2) development of a geothermal steam reservoir model to evaluate the many thermophysical, hydrodynamic, and chemical parameters involved; and (3) development of a laboratory model of an explosion-produced chimney to obtain experimental data on the processes of in-place boiling, moving flash fronts, and two-phase flow in hot porous media, as well as chemical and radiochemical data for the fluids production. The progress achieved during the initial period of the project was reported in this first progress report. (Sanderson-ISWS)
W76-02685

GROUNDWATER POLLUTION CONTROL IN AN INDUSTRIALIZED PART OF THE TRENT BASIN,
Trent River Authority (England).
For primary bibliographic entry see Field 5G.
W76-02691

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
D. A. Nutbrown, R. A. Downing, and R. A. Monkhouse.
Journal of Hydrology, Vol 27, No 1/2, p 127-142, October 1975. 8 fig, 1 tab, 7 ref.

Descriptors: *Aquifer management, *Groundwater, *Movement, *Computer models, *Dynamic programming, Effects, Infiltration, Water policy, Decision making, Hydrology, Optimization, Pumping, Water distribution(Applied), Forecasting, Saline water intrusion, Storage, Water levels, Water yield improvement, Rainfall, Artificial recharge, Estimating, Operations research, Systems analysis.
Identifiers: *Chalk Aquifer(South Downs England), Maximum yield, Abstraction.

A digital model has been used to describe the transient effects of natural infiltration and abstraction on the movement of groundwater and to assist with the longterm management of the Chalk aquifer of the South Downs. The primary aim of the study reported herein was to estimate the maximum yield of the aquifer, bearing in mind the important limiting factor that it is susceptible to saline intrusion, both from the sea and from tidal rivers. After the model was calibrated, several experiments were performed with reference to the long-term development and operation of the aquifer. Abstraction regimes, designed to maximize final storage in the aquifer, were generated automatically by the model using a dynamic programming approach. Under conventional methods of development, the conditions likely to prevail at the limit of development, particularly at the end of an extended period of limited infiltration, were investigated and their influence on future management proposals considered. The possibility of extending the development limit by means of artificial recharge was also studied using the model. (Bell-Cornell)
W76-02714

APPLICATION OF THE SAGAR METHOD FOR THE SOLUTION OF THE INVERSE PROBLEM IN GROUND-WATER HYDROLOGY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2F.
W76-02730

GROUNDWATER POLLUTION FROM SANITARY LANDFILL LEACHATE, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W76-02733

ECONOMIC ADJUSTMENT TO A NEW IRRIGATION WATER SOURCE: PINAL COUNTY, ARIZONA AND THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-02737

THE APPLICATION OF STEP-DRAWDOWN PUMPING TESTS FOR DETERMINING WELL LOSSES IN CONSOLIDATED ROCK AQUIFERS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
V. W. Uhl, Jr., V. G. Joshi, A. Alpheus, and G. Sharma.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology

Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 133-146, 2 fig, 3 tab, 11 ref.

Descriptors: *Aquifers, *Step-downs, *Drawdown, *Water level fluctuations, *Pumping, *Wells, Water levels, Transmissivity, Rock properties.
Identifiers: India.

Analysis of step-down test data enables the quantification of the components of drawdown due to formation of aquifer loss, and due to well losses in a pumped well. This technique has been used to test approximately 100 wells that were drilled in crystalline and basalt formations in central India. Anomalies in test analysis often proved helpful for interpreting aquifer irregularities. In general, the well loss constant decreased with an increase in specific capacity and the aquifer loss constant decreased with increasing transmissivity. Significant reductions in specific capacity during a step test occurred in wells with high well losses. An attempt was made to quantify the well losses in a consolidated rock well. A number of practical applications of step-drawdown tests are discussed. (McLachlan-Arizona)
W76-02747

WATER RESOURCES OF THE WOODY MOUNTAIN WELL FIELD AREA, COCONINO COUNTY, ARIZONA,
Northern Arizona Univ., Flagstaff.
E. L. Montgomery, and R. H. DeWitt.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Adacemy of Science, April 11-12, 1975, Tempe, Arizona, p 147-158, 6 fig, 1 tab, 5 ref.

Descriptors: *Water resources, *Arizona, *Wells, *Groundwater availability, *Recharge, Withdrawal, Well data, Well spacing, Faults(Geologic), Groundwater, Aquifers.
Identifiers: Woody Mountain, Coconono County(Ariz), Oak Creek Fault(Ariz).

Conclusions drawn from a water resources study of the Woody Mountain area are: the average coefficients of transmissibility and of storage of the principal aquifer are approximately 30,000 gpd/ft and 0.05 respectively; drawdown in wells is greater than predicted using theoretical calculations due to the turbulent flow near the well bore in the fractured coconino aquifer; the computed interference between pumped wells in the field ranges from 10.5 ft. to 19.7 ft. Interference would be negligible between wells spaced at distances greater than 6,000 ft. for pumping periods as long as two hundred days; the negative boundary effect of off-set on the Oak Creek Fault may be balanced by the recharge effect of groundwater located in the highly permeable fractured zone afjacent to the fault; and the quantity of recharge water to the well field is greater than withdrawals from the wells. (McLachlan-Arizona)
W76-02748

CHEMISTRY OF EFFERVESCING GROUNDWATER FROM MUNICIPAL WELLS, FLAGSTAFF, ARIZONA,
Northern Arizona Univ., Flagstaff.
J. C. Germ, and E. L. Montgomery.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 159-167, 3 fig, 3 tab, 4 ref.

Descriptors: *Effervescence, *Groundwater, *Wells, *Arizona, *Groundwater recharge, Gases, Aquifers, Chemical analysis.
Identifiers: Flagstaff(Ariz).

Gas which effervesces from groundwater from Flagstaff's municipal wells is derived from dissolved atmospheric air. Groundwater from the Coconino aquifer at the Flagstaff municipal wells is classified as calcium magnesium bicarbonate sulfate water and is similar to groundwater pumped from the Coconino aquifer by other wells in the flagstaff area. The source of the gas which effervesces from groundwater pumped by the municipal wells is believed to be air which is trapped in the Coconino aquifer during recharge. (McLachlan-Arizona)
W76-02749

TRANSFORMATIONS IN QUALITY OF RECHARGING EFFLUENT IN THE SANTA CRUZ RIVER,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5E.
W76-02750

SALT BALANCE IN GROUNDWATER OF THE TULARE LAKE BASIN, CALIFORNIA,
K. D. Schmidt.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, Ameridan Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 177-184, 1 fig, 2 tab, 7 ref.

Descriptors: *Salt balance, *Water management(Applied), *Water quality, *Groundwater, *Irrigation efficiency, Irrigation water, California, Water importing, Monitoring.
Identifiers: Tulare Lake Basin(Calif).

The Tulare Lake Basin at the base of the Sierra Nevada Mountains is the basis for water supply for several cities and a highly productive agricultural area. Little attention has been given to groundwater quality during the past one hundred years. A careful study of the salt balance produced a set of guidelines for future groundwater managers to follow. The major emphasis for future water consumption should be the efficient use of irrigation. This would produce a positive impact on groundwater quality, energy savings, and less imported water would be needed. Groundwater management in the future must consider water quality as well as quantity. Appropriate monitoring programs are urgently needed to provide data on trends in groundwater quality. (McLachlan-Arizona)
W76-02751

CONJUNCTIVE AVAILABILITY OF SURFACE AND GROUND WATER IN THE ALBUQUERQUE AREA, NEW MEXICO: A MODELLING APPROACH,
Maine Univ., Orono. Dept. of Civil Engineering.
W. F. Brutsaert, and T. G. Gebhard, Jr.
Ground Water, Vol 13, No 4, p 345-353, July-August 1975. 9 fig, 4 tab, 6 ref. OWRT B-016-NMEX (7).

Descriptors: *Surface-groundwater relationships, *Conjunctive use, *Model studies, *Simulation analysis, *Available water, *New Mexico, Water management(Applied), Aquifer systems, Computer models, Forecasting, Regression analysis, Groundwater, Water resources development, Groundwater basins, Groundwater potential.
Identifiers: *Albuquerque(NMex), *Aquifer response.

The relationship of dynamic ground-water availability and aquifer behavior under projected stresses was modeled by a groundwater system simulator based on a mass balance of the hydrologic basin. Conditions from extreme dry to extreme wet were modeled, combined with a range of different water demands. A vast amount of information was thus obtained in the form of aquifer responses for different conditions. An analogous relationship was constructed from these data by stepwise multiple regression analysis of the change in water-table elevation for the time period considered, the water-table elevation at the end of the previous time period, and a lump factor combining surface-water inflow and outflow, precipitation, and beneficial and nonbeneficial water uses. Other results readily obtainable from the simulation runs were river accretion or depletion curves as a function of time. These curves showed the diversion effects of groundwater pumping upon the river. (Prickett-ISWS)
W76-02936

COMPARATIVE STUDY OF FRESH-SALT WATER INTERFACES USING FINITE ELEMENT AND SIMPLE APPROACHES,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-02940

A DIRECT METHOD FOR THE IDENTIFICATION OF THE PARAMETERS OF DYNAMIC NONHOMOGENEOUS AQUIFERS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2F.
W76-02943

GROUND WATER FOR IRRIGATION IN THE VIKING BASIN, WEST-CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
M. S. McBride.
Available from NTIS, Springfield, Va 22161 as PB-246 565, $4.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 23-75, October 1975. 48 p, 21 fig, 2 plate, 7 tab, 13 ref.

Descriptors: *Supplemental irrigation, *Groundwater basins, *Aquifer characteristics, *Environmental effects, *Minnesota, Water supply, Groundwater resources, Glacial drift, Drawdown, Water quality, Data collections, Water yield, Model studies, Available water.
Identifiers: *Outwash plains, *Viking basin(Minn), *Glacial outwash.

The Viking Basin consists of six glacial outwash areas in Douglas, Ottertail, and Todd Counties, west-central Minnesota. Total area is 340 square miles (880 square kilometres). Soils are sandy and excessively well-drained. Crops grown on the outwash would benefit from supplemental irrigation. Irrigation supplies can be obtained from wells in the surface aquifer in significant parts of the large outwash areas near Carlos and Parkers Prairie and the small outwash area near Clotho. Irrigation supplies are unlikely in the outwash areas near Alexandria, Urbank. and Rose City. Major use of groundwater for irrigation may lower groundwater levels sufficiently to affect lake and marsh levels and streamflow out of the irrigation areas. Water from the outwash is of excellent chemical quality for irrigation. (Woodard-USGS)
W76-02949

GROUND-WATER RESOURCES OF AMERICAN SAMOA WITH EMPHASIS ON THE TAFUNA-LEONE PLAIN, TUTUILA ISLAND,
Geological Survey, Honolulu, Hawaii.
C. B. Bentley.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 289, $4.50 in paper copy, $2.25 in microfiche. Water-Resources Investigations 29-75, September 1975. 33 p, 3 fig, 2 plate, 1 tab, 17 ref, append.

Descriptors: *Groundwater resources, *Water quality, *Islands, *Pacific Ocean, *Surface-groundwater relationships, Hydrogeology,

Aquifer characteristics, Observation wells, Water wells, Water yield, Water table, Perched water, Saline water-freshwater interfaces, Water resources development.
Identifiers: *American Samoa, *Tutuila Island(Samoa), Tafuna-Leone plain.

This report describes the availability and chemical quality of the groundwater in the American Samoa islands. Groundwater is being developed as the principal water-supply source and the most promising area for development on Tutuila Island is the Tafuna-Leone plain. The aquifers are located in thin-bedded basaltic flows, tuff, and cinders and in underlying beach and lagoonal sedimentary deposits. Aquifers are basal-type with a freshwater lens floating on saltwater and capable of producing about 200 gpm (gallons per minute) to wells. Groundwater on Aunu'u, Ta'u, Ofu, and Olosega occurs as basal groundwater and as perched or high-level water. Yields are small but the central part of Ta'u may contain large quantities of high-level water. The fresh groundwater quality generally is good and meets standards set for drinking water by the U.S. Public Health Service. However, seawater intrusion can be a problem in wells that tap the basal lens. (Woodard-USGS)
W76-02950

WATER RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NEVADA, 1974-75,
Geological Survey, Las Vegas, Nev.
J. D. Larson.
Open-file report, 1975. 12 p, 7 fig, 1 tab, 2 ref.

Descriptors: *Basic data collections, *Groundwater resources, *Water level fluctuations, *Spring waters, *Irrigation, Water yield, Water utilization, Withdrawal, Irrigation wells, Deserts, *Nevada, Collapse, Faults(Geologic), Sagponds.
Identifiers: *Devils Hole area(Nev).

The Geololgical Survey collected water-level, spring-flow, and power-consumption data in the Devils Hole area, Nevada, from July 1974 through June 1975. The work for this third annual data report was financed by the National Park Service. Continuous recorders were used to monitor water levels in Devils Hole, three observation wells, and the flow from four springs. Also, monthly readings were made on two wells to help define a general trend of groundwater levels. Monthly meter readings of six electrically powered irrigation wells provided a record of power consumption, which in turn is a measure of the amount of water pumped. The purpose of the work is to observe the effects of groundwater withdrawals for irrigation on the level in Devils Hole and the flow from the major springs in the area. The pool in Devils Hole, which is a collapsed fault structure, is the only known native habitat of desert pupfish, Cyprinodon diabolis. (Woodard-USGS)
W76-02958

DOCUMENTATION OF FINITE-DIFFERENCE MODEL FOR SIMULATION OF THREE-DIMENSIONAL GROUND-WATER FLOW,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-02962

GROUND-WATER LEVELS IN WYOMING, 1974,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 7C.
W76-02964

PREDICTED EFFECTS OF PUMPING ON LOWERING THE WATER TABLE IN THE TWIN, CRYSTAL, RYAN LAKES-HIGHWAY 100 AREA, HENNEPIN COUNTRY, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4C.
W76-02965

EVALUATION OF THE AQUIFER CHARACTERISTICS OF THE BASALTIC TERRAIN OF MAHARASHTRA IN INDIA,
Central Groundwater Board, Nagpur (India).
For primary bibliographic entry see Field 2F.
W76-02970

4C. Effects On Water Of Man's Non-Water Activities

METHODS OF AVALANCHE CONTROL ON WASHINGTON HIGHWAYS, FOURTH ANNUAL REPORT,
Washington Univ., Seattle. Dept. of Geophysics; and Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W76-02546

THE FACTS OF LIFE,
Wisconsin Univ. Center System-Marinette County, Bay Shore. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-02651

BENEFICIAL AND DETRIMENTAL EFFECTS OF RANGE IMPROVEMENT PRACTICES ON RUNOFF AND EROSION,
Utah State Univ., Logan. Coll. of Natural Resources; and Utah State Univ., Logan. Watershed Science Unit.
G. F. Gifford.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 216-248, 10 fig, 8 tab, 82 ref.

Descriptors: *Range management, *Revegetation, *Soil conservation, *Runoff, Erosion, *Water sources, Ranges, Vegetation establishment, Water conservation, Forest management, Conservation, Clear-cutting, Vegetation effects, Surface runoff, Sediment yield, Soil surfaces, Planting management, Contour furrows, Trenches, Reservoir construction, Water spreading.
Identifiers: *Range improvement practices, Pitting, Ripping, Plowing, Chaining, Gully plugs.

Range improvements are generally considered to be special treatments, developments, and structures used to improve range forage resources or to facilitate their use by grazing animals. In many cases only broad generalizations of the beneficial or detrimental effects of range improvement practices are possible since several improvement practic4s are generally used together thus confounding the impact of a single treatment by itself. Subjects discussed include: pitting (the forming of small pits in the soil in order to catch and hold rain and runoff), ripping or subsoiling, plowing, chaining, seeding, contour furrows, contour trenches, gully plugs, small reservoir construction, and water spreading. Range improvement practices are not all beneficial from the standpoint of runoff and sediment production, and in fact, most research has shown that improvement practices which involve severe mechanical disturbance should not be expected to improve hydrologic conditions. Since the life of most mechanical treatments is relatively short, it is imperative that a desirable vegetative cover be established and properly maintained. Where adequate (greater than or equal to 70% cover) vegetation has been established as a result of some improvement scheme, then improvements in hydrologic behavior are also generally noted. (Robinett-Arizona)
W76-02671

MODELING MANAGEMENT OF PONDEROSA PINE FOREST RESOURCES,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
M. B. Baker, Jr.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975 Logan, Utah. p 478-493, 8 fig, 4 tab, 7 ref.

Descriptors: *Pondersa pine trees, *Forest management, *Vegetation effects, *Clear-cutting, *Cost-benefit ratio, Coniferous forests, Conservation, Lumbering, Recreation, Watershed management, Vegetation, Land management, Cutting management, Pinyon pine trees, Pine trees, Juniper trees, Water yield, Soils, Forages, Wildlife, Economics, *Arizona.
Identifiers: *Salt-Verde River Basin(Ariz), *Beaver Creek watershed(Ariz).

Attempts are made to evaluate the effects of vegetation changes in the 275,000-acre Beaver Creek watershed (chosen to represent the pinyon-juniper and ponderosa pine types within the Salt-Verde Basin, Arizona) on water yield, soil, forage, wildlife, and recreation, as well as determining whether these changes alter the risk from such disasters as fire, insects, and disease. Water yield increases of up to 1 to 2 inches per year were noted over a 6-year period as a result of various intensities and patterns of timber basal area reduction. A timber simulation model suggests that harvestable timber volume growth can be increased, even with substantial reductions of timber basal area. Herbage production can increase 500 pounds per acre per year on low to moderately productive soils as the result of complete overstory removal, in addition to the improvement of deer and elk habitat. A benefit-cost ratio of $3.30 was estimated for the option of intensive management of the more productive pine sites (about one-third of the area) for tree growth, the interspersing of wildlife-oriented treatments on about one-third of the area, and severe thinning on the remaining one-third of the pine stands. (Robinett-Arizona)
W76-02672

THE IMPACT OF SUBURBANIZATION ON FLUVIAL GEOMORPHOLOGY,
Iowa Univ., Iowa City. Dept. of Geography.
W. L. Graf.
Water Resources Research, Vol. 11, No. 5, p 690-692, October 1975. 4 fig, 1 tab, 4 ref.

Descriptors: *Geomorphology, *Fluvial sediments, *Urban runoff, *Colorado, Watersheds(Basins), Flood plains, Sediments, Surface runoff, Erosion, Deposition(Sediments), Flood peak, Drainage, Stream erosion, Sediment transport, Drainage patterns(Geologic), Land use, *Suburban areas, *Urbanization.
Identifiers: *Fluvial geomorphology, Suburbanization, *Denver(Colo), Stream length.

Analysis of aerial photography for the period 1950-1971 and field data collected from 1970 to 1974 indicated that in the Denver area suburban development has caused significant changes in fluvial systems. By first introducing large quantities of sediment and later by increasing surface runoff, suburban development leads to an expansion of floodplains followed by downcutting of streams. As areas of suburban development increase, greater percentages of stream lengths are dominated by transportation, and lesser percentages are dominated by erosion and depostion. (Lee-ISWS)
W76-02702

HIGHWAY AND SEWER IMPACTS ON URBAN DEVELOPMENT,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W76-02717

MULTIPLE USE EFFECTS OF MANIPULATING PINYON-JUNIPER,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W76-02723

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Massachusetts Univ., Amherst. Water Resources Research Center.
D. O. Doehring, M. E. Smith, and J. G. Fabos.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 407, $4.00 in paper copy, $2.25 in microfiche. Water Resources Research Center Publ No 53, June 1975. Completion Report FY-75-6, 29 p, 16 fig, 7 tab, 14 ref. OWRT A-074-MASS(1). 14-31-0001-5021.

Descriptors: *Flood plains, Model studies, *New England, Risks, Flood frequency, *Land use, Mathematical models, Flood forecasting, Regression analysis, *Urbanization.
Identifiers: Flood hazard analysis.

The relation between land use changes and flood expectancies in southeastern New England is examined. The common assumption that urbanization affects only floodplains related to low return period events is also evaluated with respect to this region. Watershed morphometry, surficial character, and land use were considered to be the most important independent variables which could be quantified. Morphometry was taken from U.S. Geological Survey 7 1/2 - minute quadrangles; surficial properties were derived from U.S.G.S. geologic quandranges, Soil Conservation Service soil maps, and supplementary topographic map interpretation; and land use data for 1952 and 1972 were acquired from the Massachusetts Map Down series. The dependent variable, an index of change in flood expectancy, is conceptualized as a response to land use change; morphometry and surficial character of a given basin are conceived as factors which condition the primary response. Mathematical models which were erected by multiple regression techniques are useful for predicting change in flood expectancies and account for more than 97 percent of the total variance. The paramount finding of the research, however, is that the assumption of static floodplains corresponding to high return periods is not justified for this study area. The probable consequence of such an assumption in flood hazard analysis is to underestimate the risk.
W76-02865

CHANGES IN STORM HYDROGRAPHS AFTER ROAD BUILDING AND CLEAR-CUTTING IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. School of Forestry.
R. D. Harr, W. C. Harper, J. T. Krygier, and F. S. Hsieh.
Water Resources Research, Vol 11, No 3, p 436-444, June 1975. 1 fig, 6 tab, 25 ref. OWRT A-001-ORE (20).

Descriptors: *Runoff, *Clear-cutting, *Road construction, *Oregon, Water yield, Peak discharge, Land clearing, Pacific coast region, *Storm runoff, Streamflow, *Hydrographs, Watersheds(Basins).
Identifiers: *Runoff enhancement, Quick flow, Delayed flow.

Changes in storm hydrographs after road building, clear-cutting, and burning were determined for 6 small watersheds in the Oregon Coast Range. Peak flows were increased significantly after road building, but only when roads occupied at least 12% of the watershed. Roads had no detectable effect on volumes of storm hydrographs. By reducing transpiration and interception, partial clear-cutting increased peak flow, quick flow, delayed flow, and total storm hydrograph volume of some streams. Most increases were largest in the fall when maximum differences in soil water content existed between cut and uncut watersheds. Maximum increases in storm flow occurred after a 175-acre watershed was 82% clear-cut. Here peak flow increased 16 cu ft/sq mi, quick flow 1.5 in., and total strom hydrograph volume 2.6 in. during the fall. The average increase in winter peak flows was smaller. The effect of roads on peak flows has significance for design of culverts and bridges in headwater areas, but probably does not influence downstream flooding. Increases in streamflow after clear-cutting should have no appreciable effect on either damage to bridges and culverts in headwater areas or downstream flooding. Caution must be used in extending results of this study to storm runoff events of low frequency and large magnitude. (Jess-ISWS)
W76-02937

ASCE URBAN WATER RESOURCES RESEARCH PROGRAM,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Program.
For primary bibliographic entry see Field 2A.
W76-02939

PREDICTED EFFECTS OF PUMPING ON LOWERING THE WATER TABLE IN THE TWIN, CRYSTAL, RYAN LAKES-HIGHWAY 100 AREA, HENNEPIN COUNTRY, MINNESOTA,
Geological Survey, St. Paul, Minn.
M. S. McBride.
Administrative Report, 1974. 59 p, 15 fig, 2 tab, 11 ref.

Descriptors: *Model studies, *Water levels, *Groundwater, *Road construction, *Submergence, Forecasting, *Minnesota, Data collections, Drawdown, Water table, Baseline studies, Road design.
Identifiers: *Hennepin County(Minn).

A proposed rebuilding of Minnesota Highway 100, in the Minneapolis suburb of Brooklyn Center, would require an underpass whose readbed would be, in part, below the present water table. A digital hydrologic model of the surficial glacial outwash aquifer in the area of the underpass was made to predict:(1) the pumping rate required to keep the water table at a design level 5 ft below the roadbed, (2) the rate of drawdown and recovery, and (3) the effects of the pumping on nearby Twin, Crystal, and Ryan Lakes. The minimum total pumping rate to keep the roadbed dry would be about 2.0 cfs. At this rate, water levels at the underpass would fall to within 1 ft of the required design level within 3 to 6 weeks. If pumping stopped, water levels would rise about 1 ft in the first 10 hours. Under steady-state conditions, Twin and Crystal Lakes would be the sources of 75 percent or more of the water pumped.(Woodard-USGS)
W76-02965

4D. Watershed Protection

A WATERSHED VOLUME RESPONSE MODEL CONSIDERING CONTRIBUTING AREA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-02523

CONVERSION OF CHAPARRAL TO GRASS IN CENTRAL ARIZONA: EFFECTS ON SELECTED IONS IN WATERSHED RUNOFF,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5B.
W76-02527

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 10. VEGETATION OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ., Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W76-02560

INFLUENCE OF LAND DEVELOPMENT AND LAND USE PATTERNS ON WATER QUALITY,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-02637

VEGETATION RESPONSES TO GRAZING, RAINFALL, SITE CONDITION, AND MESQUITE CONTROL ON SEMIDESERT RANGE,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2I.
W76-02663

PREDICTING SNOWMELT RUNOFF USING A DETERMINISTIC WATERSHED MODEL WITH STOCHASTIC PRECIPITATION INPUTS,
Arizona University, Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W76-02664

STRIP MINING AND RECLAMATION ON THE BLACK MESA OF ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5G.
W76-02670

BENEFICIAL AND DETRIMENTAL EFFECTS OF RANGE IMPROVEMENT PRACTICES ON RUNOFF AND EROSION,
Utah State Univ., Logan. Coll. of Natural Resources; and Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4C.
W76-02671

MODELING MANAGEMENT OF PONDEROSA PINE FOREST RESOURCES,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-02672

ECONOMICS OF SOIL TREATMENTS IN THE UPPER COLORADO,
Utah State Univ., Logan. Dept. of Range Science.
J. P. Workman, and J. E. Keith.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 591-596, 3 tab, 11 ref.

Descriptors: *Colorado River Basin, *Sediment control, *Land management, *Erosion control, *Frail lands, *Arid lands, Colorado River, Desilting, Reservoir silting, Sediment load, Sediment yield, Erosion, Slope protection, Soil conservation, Soil stabilization, Colorado, Arizona, Lakes, Cost-benefit ratio, Economics.
Identifiers: *Lake Powell, Glen Canyon Dam.

The Upper Colorado River basin contains 1,280,000 acres of frail lands characterized by steep slopes, highly erodible soils, extremely sparse vegetation, and an arid climate. Although this area contributes only 5% of the Colorado River water flowing past Lee's Ferry, Arizona, it is responsible for about 44 percent of the sediment

load deposited into Lake Powell. In this report the economic aspects of erosion control practices on the land were studied using a minimum possible costs and maximum possible benefits procedure. Surface treatment of this area promises to yield a benefit-cost ratio of only 0.12 even under unrealistically favorable conditions. The authors conclude that although the Glen Canyon damsite will be lost in about 200 years in the absence of erosion control, surface treatments of frail land soils are not only ineffective from a physical and biological standpoint but are also unsound economically. (Robinett-Arizona)
W76-02674

STATUS MEMORANDUM ON CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02682

TIME SERIES ANALYSIS OF A WATERSHED RESPONSE VARIABLE,
Ottawa University (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-02699

THE IMPACT OF SUBURBANIZATION ON FLUVIAL GEOMORPHOLOGY,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-02702

SEDIMENT TRANSPORT FROM BIG SAGEBRUSH WATERSHEDS,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
D. L. Sturges.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 728-738, 3 fig, 3 tab, 4 ref.

Descriptors: *Sediment transport, *Sagebrush, *Suspended solids, *Soil erosion, *Snowmelt, Range management, Sediment load, Erosion, Vegetation effects, Watersheds(Basins), Watershed management, Slope stability, Bed load, Surface runoff, Soil surfaces, Precipitation(Atmospheric), Rainfall, Perennial Streams.
Identifiers: Big Sagebrush watersheds, Over-snow runoff.

Sediment transport was studied in two experimental watersheds with perennial flow located on the Stratton Sagebrush Hydrology Study Area 20 miles west of Saratoga at a 7,800-ft elevation. Sedimentation characteristics of Loco and Sane Creek may not be typical of much of the big sagebrush type as the watersheds have a higher than usual precipitation, a productive vegetative cover reflecting sound land management, and stable soils. During the 7 years of study at the Stratton area, erosion caused by intense summer rains was not important as it is in portions of the big sagebrush type. Suspended sediment concentrations were less than 11 ppm on most days through the winter, rose quickly as snowmelt runoff started in the spring reaching a maximum concentration of almost 300 ppm during maximum flow, then, decreasing rapidly, were usually less than 20 ppm through the summer. Most sediment movement occurred during snowmelt runoff when flows and suspended sediment concentrations were high. In years with over-snow runoff, sediment movement was elevated. (Robinett-Arizona)
W76-02725

EFFECTS OF SURFACE CONFIGURATION IN WATER POLLUTION CONTROL ON SEMIARID SURFACE MINED LANDS,
Montana State Univ., Bozeman. Dept. of Animal and Range Sciences.
For primary bibliographic entry see Field 5G.
W76-02726

STAGES OF DEVELOPMENT OF GULLIES IN THE WEST,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2J.
W76-02727

WATERSHED INDICATORS OF LANDFORM DEVELOPMENT,
Arizona State Univ., Tempe.
B. H. Heede.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 43-46, 4 ref.

Descriptors: *Watershed management, *Geomorphology, *Streams, *Land forming, *Streamflow, Topography, Equilibrium, Sedimentation, Erosion.
Identifiers: Dynamic equilibrium.

Traditionally, watershed management is concerned with water and sediment yield, vegetation, soils, and meteorology, but not with geomorphology. Often it is in this field that the explanation can be found for the formation and present condition of a watershed and its future development. Examples are presented to demonstrate that factors in the hydraulic geometry of streams indicate whether a watershed is in an active stage of landform development, or is in dynamic equilibrium. Some general guides for the practitioner are provided. Watershed management research cannot afford to ignore the basic geomorphic setting of watersheds. If geomorphology is not considered, the researcher's results could be misinterpreted. (McLachlan-Arizona)
W76-02739

THUNDERSTORM PRECIPITATION EFFECTS ON THE RAINFALL-EROSION INDEX OF THE UNIVERSAL SOIL LOSS EQUATION,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W76-02740

VARIABILITY OF INFILTRATION CHARACTERISTICS AND WATER YIELD OF A SEMI ARID CATCHMENT,
Arizona Univ. Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2G.
W76-02742

REMOTE SENSING APPLICATIONS TO HYDROLOGY IN MINNESOTA,
Minnesota Univ., Minneapolis, Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-02907

CALCULATING SNOW COVER DENSITY IN THE KYZYLCHA MOUNTAIN RIVER BASIN,
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 2C.
W76-02912

FIRST RESULTS OF INVESTIGATIONS OF THE WATER BALANCE IN RIVERS IN THE UPPER KOLYMA BASIN,
For primary bibliographic entry see Field 2E.
W76-02926

PECULIARITIES OF FORMATION OF RUNOFF OF THE UPPER KOLYMA BASIN,
For primary bibliographic entry see Field 2C.
W76-02927

REPORT ON INVESTIGATION OF WATER QUALITY OF CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02931

SEDIMENT YIELD OF SELECTED WATERSHEDS WEST OF THE GREAT PLAINS,
Arizona Univ., Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 2J.
W76-02971

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

DETERMINATION OF NITRATE IN WATER SAMPLES USING A PORTABLE POLAROGRAPHIC INSTRUMENT,
South Carolina Univ., Columbia.
R. L. Young, J. E. Spell, H. M. Siu, R. H. Philp, and E. R. Jones.
Environmental Science and Technology, Vol 9, No 12, p 1075-1077, November, 1975. 3 fig, 8 ref, 1 tab.

Descriptors: *Water analysis, *Nitrates, *Polarographic analysis, Analytical techniques, Water pollution sources, Pollutant identification, Inorganic compounds, Nitrogen compounds, Equipment, Natural streams, Water quality, Water properties, Instrumentation.

A simple portable polarographic analyzer is described. The determination of nitrate in natural water samples from the polarographic waves developed in the presence of Zr(IV) and U(VI) is reported. These catalytic systems allow direct compensation of background currents due to interferences. Results for both methods are in good agreement with those from spectrophotometric analyses, provided analyses are done at the same time. (Witt-IPC)
W76-02506

DETERMINATION OF TRACE ORGANICS IN MUNICIPAL SEWAGE EFFLUENTS AND NATURAL WATERS BY HIGH-RESOLUTION ION-EXCHANGE CHROMATOGRAPHY,
Oak Ridge National Lab., Tenn.
W. W. Pitt, Jr., R. L. Jolley, and C. D. Scott.
Environmental Science and Technology, Vol 9, No 12, p 1068-1073, November, 1975. 4 fig, 13 ref, 3 tab.

Descriptors: *Pollutant identification, *Water analysis, *Organic compounds, Chromatography, Ion exchange, Separation techniques, Analytical techniques, Water pollution sources, Water properties, Water chemistry, Natural streams, Water quality, Ultraviolet radiation, Municipal wastes, Effluents, Phenols, Carbohydrates, Amino acids, Organic acids.
Identifiers: Alkaloids.

Automated, high-resolution ion-exchange chromatographs, previously developed for the analysis of the molecular biochemical constituents in human body fluids, have been applied to the analysis of various polluted waters. Samples of polluted waters have been collected from selected sources, concentrated up to 10,000-fold, and chromatographed on high-pressure ion-exchange columns. Monitoring of the column eluates for ultraviolet absorbance and cerate oxidizability has revealed the presence of numerous organic contaminants, many of which have been subsequently identified by auxiliary techniques such as mass spectrometry. In the primary and secondary effluents from a domestic sewage treatment plant, 56 and 13 organics, respectively, have been identified. A total of 16 different organic compounds have been identified in five different natural waters. All identified pollutants are listed. They include carboxylic and amino acids, phenols, sugars (glucose, galactose), sugar alcohols, alkaloids, and miscellaneous types of organic compounds. (Witt-IPC)
W76-02507

APPLICATION OF ENERGY-DISPERSIVE X-RAY FLUORESCENCE TO TRACE METAL ANALYSIS OF NATURAL WATERS,
California Univ., Davis. Crocker Nuclear Lab.
J. F. Elder, S. K. Perry, and F. P. Brady.
Environmental Science and Technology, Vol 9, No 12, p 1039-1042, November, 1975. 3 fig, 20 ref, 3 tab.

Descriptors: *Water analysis, *Trace elements, *Metals, X-ray fluorescence, Analytical techniques, Water pollution sources, Pollutant identification, Inorganic compounds, Equipment, Costs, Water properties, Water chemistry, Natural streams, Water quality, Dissolved solids, Lakes, Cations.
Identifiers: Lake Tahoe(California).

Energy-dispersive x-ray fluorescence is a relatively recent development in the field of x-ray spectrometry which improved capability for rapid multielement analysis. Application of the technique to analysis of dissolved trace metals in water requires transfer of the dissolved elements to a uniform target suitable for analysis. This can be accomplished by precipitating the elements with the nonspecific chelating agent, ammonium-l-pyrrolidine dithiocarbamate, and filtering through a membrane filter. The method is applicable to many types of aqueous samples and for analysis of most transition metals. Equipment and costs, as well as advantages and limitations of the method are discussed. Data from analysis of waters in the Lake Tahoe basin are presented and discussed. (Witt-IPC)
W76-02510

COMPARATIVE ATOMIC ABSORPTION SPECTROSCOPIC STUDY OF TRACE METALS IN LAKE WATER,
Limnetics, Inc., Milwaukee, Wis.
T. Surles, J. R. Tuschall, Jr., and T. T. Collins.
Environmental Science and Technology, Vol 9, No 12, p 1073-1075, November, 1975. 10 ref, 3 tab.

Descriptors: *Water analysis, *Trace elements, *Metals, *Spectroscopy, Analytical techniques, Water pollution sources, Pollutant identification, Inorganic compounds, Water properties, Water chemistry, Natural streams, Water quality, Lakes, Copper, Chromium, Cadmium, Manganese, Lead, Nickel, Zinc, Cations.
Identifiers: Atomic absorption spectra.

Two methods of atomic absorption spectroscopic analysis of lake water were used in this study: (1) flameless atmomization, using a Massmann-type graphite furnace, and (2) flame atomization preceded by a chelation/solvent extraction concentration procedure. Analyses were performed for Cu, Cr, Cd, Mn, Pb, Ni, and Zn. The sensitivities and detection limits for many metals using a graphite furnace are known to be better than those using any flame methods. Results from this study indicate that, by using proper procedures, accuracy and precision of flameless atomization methods are equal to those for chelation/solvent extraction flame methods. (Witt-IPC)
W76-02511

MEASUREMENT AND ANALYSIS OF TEMPORAL VARIATIONS OF SALINITY IN SHALLOW WATER,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-02542

BACKGROUND INFORMATION FOR PROPOSED NEW SOURCE PERFORMANCE STANDARDS: ASPHALT CONCRETE PLANTS, PETROLEUM REFINERIES, STORAGE VESSELS, SECONDARY LEAD SMELTERS AND REFINERIES, BRASS OR BRONZE INGOT PRODUCTION PLANTS, IRON AND STEEL PLANTS, SEWAGE TREATMENT PLANTS: VOLUME 2, APPENDIX: SUMMARIES OF TEST DATA.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs; and Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
For primary bibliographic entry see Field 5G.
W76-02543

EVALUATION OF AN INFRARED OIL FILM MONITOR,
Wright and Wright, Inc., Newton Center, Mass.
D. E. Wright, and J. A. Wright.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-004 912, $5.50 in paper copy, $2.25 in microfiche. Report No. CG-D-51-75, September 1974. 111 p, 55 fig, 1 append. DOT-CG-33672-A.

Descriptors: *Monitoring, *Oil, *Infrared radiation, *Reflectance, *Evaluation, *Pollutant identification, On-site investigations, Measurement, Value engineering, Water analysis, Oil pollution, Oil wastes, Oil spills, Oily water, Analytical techniques, Physical properties, Refractivity, Instrumentation, Water pollution, Oil-water interfaces, Laboratory tests, Films, Pollutants, Remote sensing, Environmental effects.
Identifiers: *Oil film detector, *Infrared reflectance, *Oil pollution monitoring, *Infrared oil film monitor, *Oil slick detector, Oil discharges, Oil films.

An evaluation program was undertaken on a remote oil film detection instrument which utilizes the infrared reflectance of water surfaces. Oil slick detection is based on a change in the normal water reflectance ratio of two wavelengths in the 3 micron spectral region. Laboratory and field tests demonstrated the instrument's ability to reliably detect petroleum films while effectively ignoring non-hydrocarbon pollutants on the water surface. The report detailed test procedures and results as well as theory of operation and functional descriptions of the instrument. (Henley-ISWS)
W76-02544

CHRIS APPENDIXES I-VI. (PRELIMINARY SYSTEMS DEVELOPMENT-CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM-CHRIS)
Little (Arthur D.), Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va 22161 as AD757 473, $9.25 in paper copy, $2.25 in microfiche. Report No 73096-1F, May 1972. 273 p, 13 fig, 4 tab, 16 ref. DOT-CG-03, 223-A.

Descriptors: *Publications, *Water pollution, *Hazards, *Chemicals, *Management, Planning, Chemical properties, Organization, Oil spills, Boiling, Dispersion, Evaporation, Safety, Thermal radiation, Disasters, Ventilation Environmental effects, Equipment.
Identifiers: *Chemical spills, Response methods, Contingency plans.

Report contained a collection of appendixes for the Final Report on the Preliminaras PB-236 615 Development of a Chemical Hazards Response Information System (CHRIS). CHRIS is composed of five manuals. The preliminary design, description of, and preliminary specifications for the manuals are contained in: (1) Appendix I, CHRIS Manual Number 1, A Condensed Guide to Chemical Hazards; (2) Appendix II, CHRIS Manual Number 2, Hazardous Chemical Data; (3) Appendix III, CHRIS Manual Number 3, Regional Contingency Plan Data Base; (4) Appendix IV, CHRIS Manual Number 4, Hazard Assessment Handbook; and (5) Appendix V, CHRIS Manual Number 5, Response Methods Handbook. The manual were designed to meet the needs of personnel who respond to emergencies involving the accidental release of hazardous chemicals into water. Appendix VI contained a description and recommendations for the organization required to support and maintain CHRIS. A staff consisting of both technical specialists and administrative personnel would be required to manage and operate CHRIS prior to and following its deployment. (Humphreys-ISWS)
W76-02552

IMPROVEMENTS IN PHENOLDISULFONIC ACID METHOD FOR DETERMINATION OF NOX,
Pratt and Whitney Aircraft, East Hartford, Conn.
D. J. Robertson, R. H. Groth, and E. G. Glastris.
Environmental Science and Technology, Vol 9, No 10, p 979-981, October 1975. 1 fig, 4 tab, 3 ref.

Descriptors: *Pollutant identification, *Nitrogen compounds, *Analytical techniques, *Chemical analysis, Evaluation, *Methodology, Nitrates, Chemicals, Nitrites, Nitrogen, Analysis, Water analysis, Spectrophotometry, Instrumentation, Testing, Chemistry, Testing procedures, Water chemistry, Sampling, Evaporation, Measurement.
Identifiers: *Phenoldisulfonic acid method, *Improved procedure, *Nitrogen determinations, Borosilicate vessels, Varian model 635D, Chemiluminescence method, Federal Register, Reference method, Gaseous samples.

The phenoldisulfonic acid method prescribed by the Environmental Protection Agency gives erratic results using the procedure outlined in the Federal Register. To remedy this situation, certain variables in the analysis were studied and their effect on the results was determined. By control of these variables, reproducible and accurate analyses can be carried out. Carry out the evaporation step in new unetched borosilicate dishes, discarding any samples with a precipitate and avoiding platinum; add only enough NaOH to neutralize the acidic solution of nitrates; add excess of NH4OH prior to the spectrophotometric measurement; and read the absorbance at 405 nm. Samples of NO in N2 analyzed by the modified phenoldisulfonic acid method and chemiluminescence agreed within 1.5% on average. (Henley-ISWS)
W76-02557

COLORIMETRIC DETERMINATION OF CYANIDE, FLUORIDE AND SULFATE IN WATER,
Kansas State Univ., Manhattan
J. Ramasamy.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 75-16,967. Ph.D. Thesis, 1975, 113 p.

Descriptors: *Analytical techniques, *Pollutant identification, *Sulfates, *Fluorides, Colorimetry, Potable water, Spectrophotometry.
Identifiers: *Cyanides.

Cyanide, fluoride, and sulfate in water were determined colorimetrically, with attention to the appropriate sensitivity, convenience, speed, and specificity. The permissible limit of cyanide in drinking water is 0.01 ppm. The Koenig reaction was employed for the determination CN- by the oxidation of CN- to a cyanogen halide, CNX, in which CN+ was the reactive species. Because fluoride concentration of 1.0 ppm results in a decrease of about 50% in the number of tooth cavities occuring in persons having used fluoridated water all their lives, this is an important substance to measure. The colorimetric reagent used in this study was an inverse complex Be40R6, which can be visualized as neutral beryllium complex with oxygen, a Lewis base, being at the center of the complex instead of an acidic metal ion. Fluoride could be detected in the concentration range of 1.0 to 10 ppm. For the determination of sulfate, the ion was determined by displacement of violurate anion from barium violurate at a pH of 6.0 to 6.2 and spectrophotometric measurement of the violurate anion at 520 nm. Relatively high concentrations of sulfate are found in natural waters and extreme sensitivity in the method of detection is not required. Sulfate may be detected in the range of 30 to 900 ppm. (Kramer-FIRL)
W76-02568

HEAVY METALS IN WATERS AND SOIL ASSOCIATED WITH SEVERAL PENNSYLVANIA LANDFILLS,
Pennsylvania State Univ., University Park.
D. L. Suarez.
Available from University Microfilms Inc., Ann Arbor, Mich. 48106. Order No 75-19,822. Ph.D. Thesis, 174. 234 p.

Descriptors: *Heavy metals, *Pollutant identification, *Water quality, *Landfills, Coals, Shales, Carbonate, Isotherms, Anaerobic conditions, Leachate, Groundwater, Surface waters, Soil analysis, *Pennsylvania.
Identifiers: Todorokite, Geothite, Siderite.

Associated surface and subsurface water quality were examined for four Pennsylvania landfills in different hydrogeological settings. Two sites were in abandoned anthracite and bituminous coal strip mines; one was on shale, and the other was on a carbonate terrain. Concentrations of Fe, Mn, Cu, Zn, Ag, Pb, Cd, Cr, and Hg in water were greater than the maximum allowed. The anaerobic character and complexing properties of leach waters from solid wastes stripped large amounts of Fe and Mn and other associated trace metals from soils near the deposit sites. To characterize heavy metal associations with the Fe and Mn oxides, three sequential leaching steps were performed on the soils. Heavy metals in these soils occurred chiefly in Mn oxide coatings on quartz grains. Todorokite and geothite were the crystalline secondary oxide phases. The molar sorption capacity of the soil Fe oxides may be at least an order of magnitude lower than that of the soil Mn oxides. (Pinto-FIRL)
W76-02569

AQUEOUS COMPLEXATION OF COPPER WITH SEWAGE AND NATURALLY OCCURRING ORGANICS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5D.
W76-02570

DETERMINATION OF TOTAL PHOSPHORUS IN SUSPENDED MATTER OF NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
S. V. Lyutsarev, and S. D. Mirkina.
Okeanologiya, Vol 14, No 6, p 1107-1109. (Engl. summ).

Descriptors: *Phosphorus, *Oxidation, *Analytical techniques, Zooplankton, Plankton, *Suspended solids, Measurement, *Organic matter, Pollutant identification.

A simple method is describing for oxidizing organic matter of a sample (zooplankton) with KNO3 and KHSO4. The method requires no special equipment, few reagents or special laboratory conditions. The preparatory operation becomes approximately 3 times shorter due to this method. The accuracy of the method is 5% at a P concentration of about 3 migrograms.--Copyright 1975, Biological Abstracts, Inc.
W76-02572

OIL SPILL DETECTOR.
Chemical Engineering, Vol 82, No 22, Deskbook Issue, p 159, October 6, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Oil spills, Monitoring, Pollutant identification, Equipment.

A recent Environmental Protection Agency ruling requires all industries, not just the petroleum industry, to prepare and implement a spill prevention and cleanup plan. An oil detection device is described that will allow a plan to be developed at a reasonable cost. The oil spill detectors are floated in streams, outfalls, and swamps, or placed in the ground where spills are probable. If oil is present, a membrane conveys the oil to a calibrated sensor which then actuates an alarm. Alarm units are available which can monitor up to 20 locations, with output relay circuitry capable of automatically controlling different process functions. (Orr-FIRL)
W76-02581

OSCILLATOR CIRCUIT FOR PROVIDING A CONDUCTIVITY RATIO OF SEA WATER,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 7B.
W76-02594

WATER QUALITY DETERMINATION APPARATUS,
Kabushiki Kaisha Meidensha, Tokyo (Japan). (Assignee).
N. Furuya, E. Fujimoto, K. Amano, T. Tsukamoto, and N. Sato.
U.S. Patent No 3,913,384, 13 p, 38 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1198, October 21, 1975.

Descriptors: *Patents, *Water quality, *Water properties, *Water pollution control, *Water quality control, Turbidity, Oxidation-reduction potential, Oxygen, Turbulent flow, Electrochemistry, Chemical properties.
Identifiers: Sensors.

An apparatus is described for examining water quality, particularly a water quality determination apparatus in which the sensor element is placed in contact with the water under investigation to electrochemically determine indices representing water quality such as the amount of dissolved oxygen, concentration of hydrogen ions, oxidation-reduction potential and concentrations of various ions as well as such apparatus for optically detecting the turbidity or concentration of suspended matter. The apparatus is provided with means for moving that portion of the water under investigation which is brought into contact with the sensor section to generate a turbulent flow. The housing of the sensing device surrounding the sensor section is constricted in inner diameter in the portion adjacent the sensor section so as to increase the velocity of the test water flowing in the vicinity of the sensor to aid in the generation of the turbulent flow. The sensor section may be provided with means for applying pressure waves to the sensor to remove contaminants. (Sinha-OEIS)
W76-02596

LOWER SHEYENNE RIVER BASIN WATER - LAND - PEOPLE.
North Dakota Water Resources Research Inst., Fargo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 068, $5.50 in paper copy, $2.25 in microfiche. Completion Report, No WI-222-0005-75, September, 1974. 106 p, 13 fig, 2 diag, 30 tab. OWRT B-029-NDAK(1). 14-31-0001-4116.

Descriptors: *Land use, *Mapping, *Water quality, Chemical analysis, Population, Flow rates, Economics, Social values, Computer models, *North Dakota, Hydrogeology, Great Plains.
Identifiers: *Sheyenne River Basin(ND).

Rivers in the Northern Great Plains are carrying increasing pollutant concentrations as the density of human and livestock populations and intensity of land cultivation increase. The major emphasis of this multi-disciplinary project is to quantitatively determine the relationships among land, people, and water quality; and to evaluate the impact of alternative means to increase water quality. Activities during the first year of the project included: (1) mapping of the land use of the complete basin; (2) mapping the surface geology of the upper portion of the basin; (3) periodic testing of the river water for 22 quality indicators; (4) mapping of population densities; (5) description of socioeconomic characteristics of the basin; and (6) statistical analysis of the relationship among the water quality indicators and basin descriptors. Water quality indicators frequently exceeded established pollution standards. The variation in water quality was related to flow rates, temperature, density of human and livestock populations, and the intensity of land cultivation.
W76-02627

THE MICRODETERMINATION OF MERCURY SPECIES IN NATURAL WATER SYSTEMS BY LIQUID CHROMATOGRAPHY,
North Dakota Univ., Grand Forks. Dept. of Chemistry.
R. J. Baltisberger.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 079, $4.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report, No WI-222-010-75, January 1975. 54 p, 5 fig, 7 tab, 5 ref, 2 append. OWRT B-020-NDAK(2). 14-31-0001-3922.

Descriptors: Water chemistry, *Analytical techniques, Chemical analysis, *Chromatography, *Mercury, Water quality standards, *Pollutant identification, Ion exchange, Spectrophotometry, Cations.
Identifiers: *Mercury compounds, Liquid chromatography.

Mercury in environmental water samples can exist in several cationic forms such as Hg(2+), Hg2(2+) and CH3Hg(+). Methylmercury cation, CH3Hg(+) is formed by the methylation of Hg(2+) by aquatic microorganisms. Metalic mercury has a solubility of 0.0000003 moles/liter (60 ppb) at 25 deg and is an equilibrium with Hg(2+). This study has shown that this equilibrium is slow to be established. The fate and form of mercury compounds in aqueous solution involves complex interactions. In order to adequately establish water quality standards for this element, it is desirable to have analytical techniques capable of differentiation of the exact cationic forms of mercury in environmental water samples. Two analytical techniques were developed and tested for (1) the measurements and differentiation of inorganic and organic mercury cations in environmental samples and (2) the separation by ion exchange chromatographic means of these cation and their ultimate analysis by flameless atomic spectrophotometry.

The first method is useful in the concentration range from 0.1 to 10 ppb Hg2(2+), Hg(2+) or CH3Hg(+). The latter method is useful from 1 to 10 ppb mercury.
W76-02630

INTERACTIONS OF METALS AND SIMPLE OXYANIONS IN WATER,
North Dakota State Univ., Fargo. Dept. of Chemistry.
J. Knoeck.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 077, $3.50 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report No WI-222-009-75, April 1975. 16 p, 2 fig, 5 tab, 17 ref. OWRT B-016-NDAK(1). 14-31-0001-3627.

Descriptors: *Spectroscopy, Chemical analysis, Aqueous solutions, Model studies, Metals, Ammonium, Potassium, Salts, Anions, Correlation analysis, *Pollutant identification.
Identifiers: Vibrational spectroscopy, Infrared spectroscopy, Raman spectroscopy, *Dithiocarbamates, Oxyanions.

The infrared and Raman spectra of ammonium and potassium salts of dithiocarbamate and dithiocarbamate-d2 anions have been obtained and the 9 in plane and 3 out of plane fundamental vibrational frequencies have been assigned for the anions in the C2y point group. A single least squares converged Urey-Bradley force field was developed for both isotopic species and was compared to force fields for metal complexed dithiocarbamates. Although 23 vibrational fundamentals were assigned a single unique set of 14 Urey-Bradley type force constants could not be found. This observation was attributed to a high degree of correlation in certain combinations of force constants. A matrix was generated from the least squares Jacobian matrix and the former matrix showed that the five force constants K(CS), H(SCS), H(SCN), F(SS), and F(SN) were so highly correlated that any number of combinations of numerical values could be used for these force constants without raising the standard deviation of the entire observed-calculated frequency fit above 2.0 percent. The correlation matrix as a test for a unique force field is discussed and an alternate force field with repulsive force constants fixed at Lennard Jones potential values is presented.
W76-02633

UPPER YELLOWSTONE RIVER WATER QUALITY: AUGUST 1973 - AUGUST 1974,
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
For primary bibliographic entry see Field 5B.
W76-02638

WATER RESOURCES DATA FOR NEBRASKA, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 7C.
W76-02656

STUDY OF CORROSION PRODUCTS IN THE SEATTLE WATER DEPARTMENT TOLT DISTRIBUTION SYSTEM,
National Environmental Research Center, Gig Harbor, Wash. Northwest Water Supply Research Lab.
R. A. Dangel.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-670/2-75-036, May 1975. 21 p, 10 tab, 8 ref, append. 1CB047; ROAP 21AQF; Task 04.

Descriptors: *Potable water, *Pollutant identification, *Corrosion, Washington, Distribution systems, Water supply, *Metals, Trace elements.
Identifiers: *Seattle(Wash), Flameless atomic absorption.

Samples from the Seattle Water Department's Tolt distribution system were analyzed for chemical and bacteriological parameters. Changes from the raw water quality were observed, particularly in trace metal concentrations and other parameters related to corrosion. Distribution mains were adequately protected from corrosion by cement and bituminous linings whereas service lines and household plumbing were actively corroded. Metals in the microgram per liter concentration range were determined by a flameless atomic absorption technique. (EPA)
W76-02660

SEVERAL CONTRIBUTIONS TO THE EVALUATION OF THE DISSOLVED CARBON DIOXIDE CONTENT OF DANUBE WATER, (IN GERMAN),
For primary bibliographic entry see Field 5B.
W76-02661

ECOLOGICAL RAMIFICATIONS OF SILVER IODIDE NUCLEATING AGENT ACCUMULATION IN A SEMI-ARID GRASSLANDS ENVIRONMENT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 3B.
W76-02665

STATUS MEMORANDUM ON CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02682

STUDY OF RIVER POLLUTION CAUSED BY MICROPOLLUTANTS,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5B.
W76-02692

RESULTS OF SEA SURFACE MAPPING IN THE PERU UPWELLING SYSTEM,
San Francisco State Univ., Calif. School of Natural Sciences.
J. C. Kelley, T. E. Whitledge, and R. C. Dugdale.
Limnology and Oceanography, Vol 20, No 5, p 784-794, September 1975. 11 fig, 2 tab, 15 ref. NSF GB-35880X, ONR N-00014-67-A-0103-0014.

Descriptors: *Mapping, *Oceanography, *Coasts, *South America, Temperature, Salinity, Nitrates, Silicates, Phosphates, Fluorescence, Upwelling, Bathymetry, Chlorophyll, Ecology, Ecosystems, On-site investigations, Oceans, Measurement.
Identifiers: *Coastal upwelling, *Peru, Ocean ecology, Capes.

Sea surface maps of temperature, salinity, nitrate, silicate, phosphate, and fluorescence were produced almost daily during a 6-week cruise (PISCO) in the Peru upwelling system in the austral fall, 1969. The maps were produced by a shipboard computer from data gathered with the ship underway. The maps show persistent 'plumes' of freshly upwelled water associated with coastal irregularities and prominent bathymetric features. The information on the location, orientation, and extent of these plumes was used to locate stations where primary productivity experiments were carried out. The definition of persistent plumes has led to the development of successful two-dimensional simulation models of the ecosystem. (Lee-ISWS)
W76-02698

RAIN SCAVENGING OF SO2 AND SULFATE FROM POWER PLANT PLUMES,
Battelle-Pacific Northwest Labs., Richland, Wash. Atmospheric Sciences Dept.
M. T. Dana, J. M. Hales, and M. A. Wolf.
Journal of Geophysical Research, Vol 80, No 30, p 4119-4129, October 20, 1975. 6 fig, 6 tab, 18 ref.

Descriptors: *Powerplants, *Sulfur compounds, *Sulfates, *Rain, Effluents, Air pollution, Pollutants, *Path of pollutants, Raindrops, Rainfall, Washouts, Model studies, On-site investigations, Computer models, Precipitation(Atmospheric), Meteorology.
Identifiers: *Sulfur dioxide, *Scavenging, Plumes.

A model has been developed for prediction of the reversible washout of SO2 emitted from power plant plumes and other sources. Predictions of this computer code model compare favorably with washout measurements made during a number of controlled source experiments and four power plant experiments. An application of the model to previous experimental conditions of high background rain acidity showed that 'negative washout' can occur as a result of desorption of SO2 from the rain below the SO2 plume. Scavenging rates (cross-plume integrated fluxes) measured during the power plant study show that the rate of deposition of sulfate was 1-5 times greater than that of SO2 at distances from 0.4 to 11 km from the stack. The experimental phase (raindrop) oxidation and one considering 'in-plume' oxidation. Either mechanism appeared to be comparible with the observations if the SO2-sulfate reaction half time in each case is of the order of 0.07 h. This result followed from a number of assumptions, including a reasonable washout coefficient for sulfate in the in-plume case and equilibrium SO2 washout in the liquid phase case. (Sims-ISWS)
W76-02712

SIGNIFICANCE OF VITAMINE B12 IN MARINE BIOCENOSES, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
L. N. Propp.
Ekologiya, 5(6), 78-80, 1974.

Descriptors: *Vitamin B, *Analysis, Phytoplankton, Aquatic organisms, Seasonal, Ecology, Pollutant identification.
Identifiers: B-12, *Biocenoses(Marine).

Observations of the species composition and content of phytoplankton, the main link in the food chain in the sea, and the seasonal dynamics of vitamine B12 indicate that a change of dominant species of phytoplankton may be related to a change of content of the vitamin in water and it can have definite ecological significance. A study of the biological cycle of vitamine B12 in the sea will permit an evaluation of its role in the life of aquatic organisms and its sources.--Copyright 1975, Biological Abstracts, Inc.
W76-02719

GROUNDWATER POLLUTION FROM SANITARY LANDFILL LEACHATE, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
M. J. Chun, R. H. F. Young, A. S. Kawatachi, and P. R. Bolduc.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 188, $5.00 in paper copy, $2.25 in microfiche. Technical Report No 87, April 1975. 81 p, 43 fig, 6 tab, 42 ref. A-040-HI (1) OWRT. 14-31-0001-4011.

Descriptors: *Groundwater, *Landfills, *Percolation, *Chemical analysis, *Soil analysis, *Leachates, Soil chemical properties, Tests, *Hawaii, *Domestic wastes, Pollutant identification, *Ion exchange, *Microbial degradation, Path of pollutants.
Identifiers: Leachate analysis, Oahu(Hawaii), Oxisol soils.

A two-year study was conducted to determine the chemical characteristics of leachate derived from domestic refuse typical of that found for Honolulu, Hawaii, and to determine the removal characteristics of select Oahu soils with respect to the substances found in these leachates. Four Oxisol soils (Molokai, Wahiawa, Helemano, and Lahaina), one Mollisol soil (Mamala), and one Marsh soil, were subjected to both saturated and unsaturated flow conditions, using as the percolating liquid, leachate produced by saturating (domestic refuse) with water. The domestic refuse had a composition typical for that of Honolulu, Hawaii. Leachate and percolate samples were analyzed for various chemical constituents including pH, hardness, alkalinity, nutrients, chemical oxygen demand, particulates, and a number of metallic cations and heavy metals. Ion exchange was responsible for altering the concentration of inorganic substances in the percolating liquid, while microbial degradation appeared to be the primary mechanism for removing organic substances. Under the test conditions, and using the leachate produced from typical Honolulu refuse, the soils examined were found to have relatively low exchange capacities, while at the same time, organic removals were not significant. Thus, migration of inorganic and organic substances to the groundwater table is possible, and these results suggest that a cautious approach to landfill site selection should be taken, although soil depth to water table and dilution characteristics of the underlying groundwater must also be considered.
W76-02733

THE DEPENDENCE OF THE COMPLETENESS OF NONFERROUS HEAVY METAL SEDIMENTATION FROM WASTE WATERS ON THE PROPERTIES OF THE FILTRATING FABRIC (ZAVISIMOST' POLNOTY OSAZHENIYA TYAZHELYKH TSVETNYKH METALLOV IZ STOCHNYKH VOD OT SVOYSTV FIL'TROVAL'NOY TKANI),
R. K. Alekseyeva, and A. P. Seligerskaya.
Tsvetnyye Metally, No 6, p 29-31, 1973. 2 fig, 3 ref.

Descriptors: *Filters, *Waste water treatment, *Filtration, *Heavy metals, Electrolysis, Chlorination, Lime, Nickel, Carbonates, Laboratory tests, Analytical techniques.
Identifiers: Filter fabrics.

The influence of the properties of the filtrating fabric on the retention of nickel from electrolysis-generated waste water has been studied in laboratory experiments. Prior to filtration through tissue filters, the waste water was chlorinated at a chlorine expenditure of 0.25 kg/cu m, and subsequently neutralized by means of lime or soda. This process is theoretically suitable for the reduction of the residual nickel content in treated water to 0.15 mg/liter. Increased nickel content in the filtrate as compared to the admitted solution was observed when belting or other cotton fiber fabric was used as filter material. When lavsan was used as filter material, no change in the nickel concentration before or after filtration of the carbonate solution was noted. (Takacs-FIRL)
W76-02791

HOW A CHEMICAL PLANT BEATS POLLUTION.
For primary bibliographic entry see Field 5D.
W76-02798

METHOD FOR DETERMINATION OF ACRYLONITRILE AND ACETONITRILE IN WASTE WATERS (METODA PENTRU DETERMINAREA ACRILONITRILULUI SI ACETONITRILULUI IN APEL REZIDUALE),
T. Stefanescu, and Gh. Ursu.
Materiale Plastice, Vol 10, No 6, p 330-334, June, 1973. 4 fig, 5 tab, 10 ref.

Descriptors: Waste water treatment, *Industrial wastes, Chemical wastes, Chemical industry, *Analytical techniques, *Pollutant identification, Measurement, Separation techniques.
Identifiers: *Acrylonitrile, *Acetonitrile.

A method for determining acrylonitrile and acetonitrile in waste water, based on their separation from polluted water by azotropic distillation with methyl alcohol and final determination by dosing the resultant ammonia through alkaline saponification, has been perfected. Acrylonitrile is determined by means of excess glycolic acid and subsequent titration with iodine in the presence of amidol, an indicator. Acetonitrile is determined by deducting from the total nitrile content the acrylonitrile content. The precision of the method is sufficient for determining quantities less than two mg/liter of acrylonitrile and acetonitrile. (Takacs-FIRL)
W76-02810

FORMATION OF METHYL MERCURY BY BACTERIA,
Georgia Univ., Atlanta. Dept. of Food Science.
M. K. Hamdy, and O. R. Noyes.
Applied Microbiology, Vol 30, No 3, p 424-432, September 1975. 5 fig, 3 tab, 39 ref.

Descriptors: *Heavy metals, *Mercury, *Enteric bacteria, *Analytical techniques, *Cultures, Microbiology, Bacteria, Chromatography, Spectrophotometry, *Pollutant identification, Georgia.
Identifiers: *Methyl mercury, *Savannah River(Geo), Atomic absorption spectrophotometry, Thin-layer chromatography, Gas-liquid chromatography, Glucose basal salt broth.

Twenty-three Hg(++)-resistant cultures were isolated from sediment of the Savannah River in Georgia to study the transformation in aquatic environments of inorganic divalent mercury compounds to methyl mercury. Adaptation using serial dilutions and concentration gradient agar plate techniques led to the selection of a highly Hg(++)-resistant strain, enterobacter alrogenes. This culture resisted 1,200 micrograms of HG(++) per ml of medium and produced methyl mercury from HgC12, but was unable to convert Hg(++) to volatile elemental mercury. Slightly more methyl mercury was formed under constant aeration than in the absence of aeration. Production of methyl mercury was cyclic in nature and slighly decreased by DL-homocysteine, but increased by methyl cobalamine. The bacterial production of methyl mercury may be a means of resistance and detoxification against mercurials in which inorganic Hg(++) is converted to organic form and secreted into the environment. Quantitative measurements were done with flameless atomic absorption spectrophotometry, thin-layer chromatography, and gas-liquid chromatography. (Hoyle-Vanderbilt)
W76-02812

WATER SAMPLING DEVICE.
French Patent 2,186,132. Applied April 11, 1973. Issured February 8, 1974. French Patents Abstracts, Vol 5, No 9, p 5, April, 1974.

Descriptors: *Patents, *Sampling, Water supply, Byoys, Equipment, Water pollution, *Pollutant identification.

A water sampling device for the supervision of water supplies is described. The device takes samples of definite intervals of time and detects the presence of impurities. The apparatus has reservoirs and can be used on buoys supported on a support at the bottom of a lake or fixed on stakes or piles. Compared with previous devices, all that is required is a rotating arm for shearing glass capillary tubes at the inlet of the reservoirs. The samples can be preserved indefinitely in the containers in a definite order. Once removed from the magazine their contents cannot be altered in any way and they can be tested by means of various probes to determine the degree of pollution. (Merritt-FIRL)
W76-02818

WATER QUALITY MEASURING APPARATUS.
Belgian Patent 806,020, Applied October 12, 1972, Issued February 1, 1974. Derwent Belgian Patents Report, Vol 5, No 8, p 1, March, 1974.

Descriptors: *Pollutant identification, *Patents, *Instrumentation, *Measurement, *Water quality, Potable water, Swimming pools, Effluents, Oxygen, Electrodes, Flow control, Flow measurements, Pipes, Pipelines.
Identifiers: Platinum, Calomel.

A water quality measuring apparatus is described for drinking water, swimming baths, and process effluent. The oxygen absorbed value of a liquid is automatically measured by the instrument using platinum/calomel electrodes as a composite, one piece probe in an amplified measuring circuit. The probe fits into a pocket through which only a fraction of the flow in a main pipe is diverted. The fraction is regulated by a flow control valve and flowmeter upstream of the pocket which discharges at negligible pressure. The instrument can be easily disconnected from the main pipeline in order to clean or renew the electrode without interfering with flow through the main pipeline. Since the electrode is not subjected to main pipeline flow and pressure conditions, it can be constructed as a cheap, lightweight unit. (Merritt-FIRL)
W76-02826

LIQUID POLLUTION MEASUREMENT.
French Patent 2,177,336, Applied March 19, 1973, Issued November 2, 1973. French Patents Abstracts, Vol 5, No 1, p 3, February 7, 1974.

Descriptors: *Measurement, *Liquid wastes, *Oxygen demand, Oxygen, *Patents, Pollutant identification, Incineration.
Identifiers: *Aluminum oxide, Incinerators.

A method of measuring liquid pollution is described in which the liquid is continuously evaluated in terms of total oxygen demand. A continuously metered flow sampled from the liquid is mixed with a measured proportion of oxygen and the mixture is fed into an incinerator, e.g., a fluidized bed of aluminum oxide powder, at > or = 816 C. The exhaust vapors are condensed, separated, and dried to produce a dry residual gas which is measured for oxygen content in an analyzer preferably calibrated to read T. O. D. values. (Merritt-FIRL)
W76-02857

DETERMINING OIL CONTENT IN WATER.
French Patent 1,278,618, Applied March 2, 1973, Issued November 9, 1973. French Patents Abstracts, Vol 5, No 2, p 3, February 14, 1974.

Descriptors: *Oil, Filters, Color, *Separation technique, *Patents, *Pollutant identification.
Identifiers: *Dielectric constant.

A method for determining oil content in water by concentrating the water sample and measuring the oil content in the concentrate is described. The oil is concentrated by passing a definite amount of water per time through a definite surface of a filter material which absorbs or separates the oil. A photoelectric device is used to determine the color change of the oil absorbing filter material. After the passage of the water, either the degree of color change is used as a measure for the oil content, or the dielectric constant of the oil absorbing filter material is determined. The measurement is used to define the oil content. The water is passed twice through the filter material in opposite flow directions so that the greater part of rust and the solid particles are removed from the filter materi-

al. The filter material consists of a thin strip of polyproplylene wool. Simple reliable determination of the oil concentration in the water is effected even at oil/water ratios below 1/100,000. (Merritt-FIRL)
W76-02859

THE DETERMINATION AND IDENTIFICATION OF MOLECULAR LEAD POLLUTANTS IN THE ATMOSPHERE,
Louisiana State Univ., Baton Rouge, La. Dept. of Chemistry.
J. W. Robinson, L. Rhodes, and D. K. Wolcott.
Analytica Chimica, Acta, Vol 78, p 474-478, 1975, 3 fig, 2 ref.

Descriptors: *Heavy metals, *Lead, *Air pollution, Louisiana, *Carbon filters, *Analytical techniques, *Pollutant identification.
Identifiers: *Baton Rouge(La), Molecular lead, Particulate lead.

An analytical method is presented for the determination and identification of lead, both as particulate lead and as lead in the free molecular form in the atmosphere. 500 cc air samples from the Baton Rouge area were put through a graphite disc to filter the particulates, then drawn through a carbon bed which absorbed the molecular lead compounds. The compounds or particulates absorfbed on the filter and carbon were atomized and determined by atomic absorption spectrometry. Lead concentrations varied significantly throughout the day, with maxima during the peak traffic conditions. Weather conditions were found to have a large effect on the concentration of molecular lead in the atmosphere. Sources of molecular lead and its effects on health are discussed. (Hoyle-Vanderbilt)
W76-02881

IMPROVEMENTS IN THE ATOMIC-FLUORESCENCE DETERMINATION OF MERCURY BY THE COLD-VAPOUR TECHNIQUE,
Shandon Southern Instruments Ltd., Camberley (England).
K. C. Thompson, and R. G. Godden.
Analyst, Vol 100, p 544-548, August 1975, 2 fig, 6 ref.

Descriptors: *Fluorometry, *Analytical methods, *Mercury, *Heavy metals, Urine, *Pollutant identification.
Identifiers: *Atomic-fluorescence, Cold-vapor technique, Blood.

Improvements have been made to a mercury-fluorescene detector system. An improvement in the detection limit of approximately 20 times has been achieved. This improvement results from various factors: decreasing the cell volume increased the sensitivity and decreased the time of measurement; an argon sheath minimized air entrainment and improved the base-line stability; a restricted lamp aperture resulted in a relative decrease in the constant background (specular reflection) level; and cooling the rear face of the mercury lamp with a stream of argon improved both the sensitivity and the base-line stability and also prevented ozone formation (which absorbs strongly at 253.7 nm) between the lamp and the mercury vapor stream. The 253.7 nm mercury line was used with the maximum spectral band pass of 6 nm. The system was tested on urine and blood samples. (Hoyle-Vanderbilt)
W76-02882

DIRECT SPECTROPOLARIMETRIC DETERMINATION OF MOLYBDENUM (VI) WITH D-(-)-1,2-PROPYLENE DIAMINE- TETRAACETIC ACID,
Midwestern Univ., Wichita Falls, Tex. Dept. of Chemistry.
R. A. Gibbs, and R. J. Palma, Sr.
Analytica Chimica Acta., Vol 76, p 199-203, 1975. 3 fig, 2 tab, 17 ref.

Descriptors: *Heavy metals, *Molybdenum, *Optical properties, *Indicators, Pollutant identification.
Identifiers: *Tungsten, Spectropolarimetric determination, Complexiметric methods.

The optically active and stereospecific compound (D-(-)-1,2-propylenediamine tetraacetic acid (D(-)PDTA) is used as the titrant in this complexiметric method for the determination of molybdenum. The titrant and complexes formed serve as self-indicators, thus permitting the maximum quantitative pH range of the metal complexes to be utilized. pH studies were performed to determine the quantitative pH range for analysis and to establish the maximum differences in rotation between the metal complex and ligand itself. The titration was done at pH 4.80 and the analysis at a wavelength of 365 nm. Mixtures of tungsten (VI) and molybdenum (VI) were titrated in sequence at pH 5.2; however, the molybdenum end point was sharp and reproducible while the tungsten end point was too indistinct. It is therefore possible to determine molybdenum in the presence of tungsten without loss of accuracy. (Hoyle-Vanderbilt)
W76-02883

A CRITICAL STUDY OF THE APPLICATION OF GRAPHITE-FURNACE NON-FLAME ATOMIC ABSORPTION SPECTROMETRY TO THE DETERMINATION OF TRACE BASE METALS IN COMPLEX HEAVY MATRIX SAMPLE SOLUTIONS,
Toronto Univ. (Ontario). Dept. of Geology.
R. B. Crux, and J. C. VanLoon.
Analytica Chimica, Acta, Vol 72, p 231-243, 1974. 8 tab, 15 ref.

Descriptors: *Heavy metals, *Spectroscopy, *Silicates, *Sewage sludge, Cadmium, Cobalt, Copper, Nickel, Lead, Zinc, *Trace elements, *Pollutant identification.
Identifiers: Graphite-furnace, Atomic absorption spectroscopy, Matrices, Blood.

A critical evaluation of the usefulness of non-flame atomic adsorption spectroscopy and its performance in heavy matrix solutions of selected trace heavy metals (cadmium, cobalt, copper, nickel, lead, and zinc) is presented. Studies of physical and chemical interference problems are presented for a range of inorganic and organic matrices: silicate rocks, treated sewage sludge, and blood. Often quoted remedies (e.g. selective volatilization, standard addition) for solution of the more serious problems were found to be of little help in most cases. The influence of variables such as nature and flow rate of purge gas, ashing temperature and atomization temperature are also evaluated. Analyses for the trace metals were done on samples by flame and non-flame methods in high solid solutions. There appeared to be an advantage to the non-flame method in dealing with sample solutions in high organic content, but no advantage is apparent for either technique with highly inorganic matrices. (Hoyle-Vanderbilt)
W76-02885

RADIOCHEMICAL DETERMINATION OF VERY LOW CONCENTRATIONS OF NICKEL IN ROCKS AND MINERALS,
R. A. Zielinski.
Journal of Research, United States Geological Survey Vol 3, No 4, p 467-473, July-August, 1975. 2 fig, 2 tab, 11 ref.

Descriptors: *Heavy metals, *Nickel, *Pollutant identification, *Radiochemical analysis, *Mineralogy, Rocks, Chemistry, Lead, Analytical techniques, Radioisotopes, Irradation, Anion exchange, Chemical precipitation.
Identifiers: Lead bead formation, Beta counting, Fire-assay technique, Detection limits, Neutron irradation, Dimethylglyoxime, Radioactive decay, Beta decay curves, Siderophile elements.

The techniques available for quantitative analysis of nickel in natural materials generally have about 10 micrograms of nickel as a lower limit for accurate determinations. Presented is a radiochemical procedure developed to obtain good accuracy and precision to levels as low as 0.1 micrograms of nickel with sensitivity as low as 0.01 micrograms. Samples are irradiated, combined with nickel carrier, and treated by a series of chemical procedures. The sample is heated until molten, lead is added, and a lead bead forms containing nickel and other siderophile elements. The lead bead is fused again and the basic element hydroxides are precipitated. The sample is put over an anion exchange column equilibrated in 12N HCl. Nickel is not absorbed while all the siderophile elements as well as copper, zinc, and mercury are retained on the column. The nickel dimethylglyoxime precipitate is formed and weighed after filtration to determine chemical yield. The sample is finally counted for beta activity of Ni 65 along with a precipitate from an irradiated nickel standard solution. Results of nickel determinations in standard rocks, rhyolite groundmass, and synthetic standards are given. (Davis-Vanderbilt)
W76-02886

THE DETERMINATION OF TOTAL MERCURY AT THE PART PER BILLION LEVEL IN SOILS, ORES, AND ORGANIC MATERIALS,
Continental Oil Co., Ponca City, Okla. Research and Development Dept.
J. W. Wimberley.
Analytica Chimica Acta, Vol 76, p 337-343, June, 1975. 2 fig, 5 tab, 13 ref.

Descriptors: *Heavy metals, *Mercury, *Analytical techniques, *Pollutant identification, *Spectrophotometry, Gold, Chemical degradation, Degradation(Decomposition), Separation techniques, Soil analysis, Coals.
Identifiers: Amalgamation, Atomic absorption, Induction furnace, Decompsition, Ore analysis, Coal analysis, Organic materials, Gold amalgamation, Mercury trap.

A method is described whereby very low levels of mercury can be determined in both inorganic (soils and ores) and organic samples such as coals. The method is fast (about 8 minutes per sample) and gives satisfactory results in the parts per billion range. Soil and ore samples are ground and sieved through an 80-mesh sieve before analysis. From 1 to 3 grams are placed in a Leco crucible and decomposed in an induction furnace heated to approximately 1000C. Mercury compounds decompose and the vaporized mercury is carried in an oxygen stream through a trap to absorb water and onto a gold coated coil, where it forms an amalgam. After the sample heating has finished, the mercury is vaporized from the coil by passing a current through the coil. The mercury vapor is swept through an optical cell where a change in absorption at 253.7 nm is detected, amplified, and recorded. The recorded peak is directly porportional to the mercury concentrations passing through the cell. (Davis-Vanderbilt)
W76-02887

THE SEPARATION OF RHODIUM AND IRIDIUM BY ANION-EXCHANGE,
Manitoba Univ., Winnepeg. Dept. of Chemistry.
G. A. Kanert, and A. Chow.
Analytica Chimica, Acta, Vol 78, p 375-382, 1975. 2 tab, 17 ref.

Descriptors: *Heavy metals, *Rhodium, *Iridium, *Ion exchange, *Analytical techniques, Anions, Pollutant identification, Separation techniques.
Identifiers: *Anion-exchange resin.

The quantitative separation and recoveries of rhodium and iridium in amounts of 100-1000 micrograms were achieved with a strongly basic anion-exchange resin. The recoveries were 98% or greater over the entire range studied. The

procedure minimizes, by heating the column and acid reservoirs, reduction and hydrolysis reactions on the resin which tend to prevent quantitative elution of the iridium. The rhodium was eluted with 0.8 M hydrochloric acid containing cerium (VI) sulfate. The cerium is washed from the resin and the iridium eluted with concentrated nitric acid at 74C. The ion exchange resin used was Amberlite IRA-400 (16-50 mesh; 8% crosslinging). (Hoyle-Vanderbilt)
W76-02888

THE COLORIMETRIC DETERMINATION OF TITANIUM IN CHROMITES,
British Museum of Natural History, London (England). Dept. of Minerology.
A. J. Easton.
Analytica Chimica, Acta, Vol 78, p 224-226, 1975. 1 fig, 9 ref.

Descriptors: *Heavy metals, *Chromium, *Titanium, *Iron, *Colorimetry, *Analytical techniques, Pollutant identification, Metals.
Identifiers: *Metal-tiron complexes.

The method given for the determination of titanium in the presence of iron and chromium allows the development of the titanium-tiron complex under conditions which reduce interference to a minimum. The quantity of titanium measurable in chromites corresponds to 0.5-2.0 ppm of Ti02 in a solution which would also contain about 100 ppm iron (as Fe20 3) and up to 250 ppm chromium (as Cr20 3). Interference caused by 250 ppm chromium was much less in the pH fange 2.0-4.0 than in the range 4.3-9.6. That of 100 ppm iron was almost eliminated by adding ascorbic acid to the aliquot before the tiron. The best wavelength for measuring the titanium-tiron complex is 360 nm (near maximum absorption) where the absorption of the chromium-tiron complex is at a minimum. A pH value of 3.0 + 0.2 is recommended for development of the titanium-tiron complex; however, at this pH the absorption of the chromium-tiron complex increased on standing. As the absorbance of the complex increases rapidly with pH, strict adherence to a pH value 3.0 + 0.2 is necessary. Correction curves can be applied to finally eliminate the interferences entirely. (Hoyle-Vanderbilt)
W76-02889

NEUTRON ACTIVATION ANALYSIS FOR BULK AND TRACE ELEMENTS IN URINE,
Ghent Rijksuniversiteit (Belgium). Instituut voor Nukleaire Wetenschappen.
R. Cornelis, A. Speecke, and J. Hoste.
Analytica Chimica Acta, Vol 78, p 317-327, 1975. 5 tab, 42 ref.

Descriptors: *Heavy metals, *Urine, *Neutron activation analysis, *Bioassay, *Analytical techniques, Electrolytes, Elements, Trace elements, Pollutant identification.
Identifiers: Urine analysis.

Problems in sampling urine for trace and bulk element analysis by neutron activation are systematically examined, and a careful analytical method ensuring reliable results is outlined. Collection, storage, sample preparation and contamination hazards during irradiation are studied in detail. Three different sizes of urine samples are prepared for analysis, depending on the concentration and nuclear properties of the elements, and suitable multielement doped urine standards are used. The samples are immediately frozen in liquid nitrogen and lyophilized upon which they are fit for irradation. As, Br, Ca, Cl, Co, Cr, Cs, Cu, Hg, I, K, Mg, Mn, Na, Rb, Se and Zn are determined. The extreme care given to sample collection, use of 'ultra-clean' vials, and work in a dust-free room, allow consistent values to be obtained. A literature review of the amounts of forty elements present in urine per day is also given. (Hoyle-Vanderbilt)
W76-02890

DETECTION OF ZINC IN CHAMPY-MAILLET'S HISTOLOGICAL STAIN BY ELECTRON PROBE ANALYSIS,
Louvain Univ. (Belgium). Departement de Neuropathologie.
J. Gilloteaux, J. Wautier, D. Laduron, and P. DeBethune.
Experientia, Vol 31, Fasc 1, p 10-12, January, 1975. 2 fig, 5 ref.

Descriptors: *Zinc, *Heavy metals, *Cytological studies, *X-ray analysis, *Iodine, Iodides, Biochemistry, Analytical techniques, Chemistry, *Pollutant identification.
Identifiers: *Electron probe analysis, Histology, Staining techniques, Osmium, Cell ultrastructure, Osmium tetroxide, Zinciodide, Histological stains, Champy-Maillet's stain.

The distribution of zinc, osmium, and iodine was investigated in stained zones of histological preparations by means of X-ray electron probe analysis. The purpose was to determine the chemical process which occurs when an osmium tetroxide zinciodide (ZIO) stain is used. Histological sections were prepared with ZIO and scanned for osmium, zinc, and iodine. The technique used allowed separate determinations to be made for each element in the same zone. X-ray intensity profiles show the distribution of osmium and zinc to be ramarkably similar. The iodine levels were too low to be recorded. This indicates that iodine is removed from the preparation, apparently by washings in the histological procedure. Although iodine may be required for the development of the stain, it is the zinc and osmium which remain associated with some cytological structures. It is postulated that complex zinc and osmium cations oxidize double bonds from organic reducing substrates in the cells. (David-Vanderbilt)
W76-02891

BIOGEOCHEMICAL EXPLORATION FOR TUNGSTEN AT BARRYTOWN, NEW ZEALAND,
Massey Univ., Palmerston North (New Zealand).
B. F. Quin, R. R. Brooks, C. R. Boswell, and J. A. C. Painter.
Journal of Geochemical Exploration, Vol 3, No 1, p 43-51, 4 fig, 4 ref, March 1974.

Descriptors: *Geochemistry, *Tungsten, *Heavy metals, *Ferns, *Plant tissues, Soil analysis.
Identifiers: *Biogeochemical exploration, Biogeochemistry, *New Zealand.

Biogeochemical prospecting for tungsten was carried out at a mineralized area near Barrytown, New Zealand. The tungsten content of the ash of leaves of the shallow-rooted tree ferns Cyathea medullaris and Dicksonia squarrosa correlated well with the concentrations of tungsten in the soil. The large tree species did not give significant correlations with tungsten in the soil but could be used to detect tungsten mineralization in bedrock in cases where this could not be achieved by soil sampling along. This detection procedure using trend surface analysis may be useful in delineating extensions of known mineralization. (Hoyle-Vanderbilt)
W76-02893

DETERMINATION OF IRON (III) IN MINERAL SAMPLES BY TITRATION WITH EDTA AND A COATED-WIRE ION-SELECTIVE INDICATOR ELECTRODE,
La Trobe Univ., Bundoora (Australia). Dept. of Inorganic and Analytical Chemistry.
R. W. Cattrall, and Chin-Poh Pui.
Analytica Chimica Acta, Vol 78, 1975. p 463-465, 1 fig, 1 tab, 2 ref.

Descriptors: *Heavy metals, *Iron, *Analytical techniques, Electrodes, *Silicates, Volumetric analysis, *Pollutant identification.
Identifiers: Potentiometric titration, *Ion-selective indicator electrode, Iron pyrites, EDTA.

The use of a coated platinum wire tetrachloroferrate (III)-selective electrode for the potentiometric titration of iron (III) withe EDTA in solution obtained by the dissolution of certain mineral samples is described. Samples of iron pyrites or silicate rock were decomposed in acid to give iron solutions with a total iron concentration of about 0.01 M and with an adjusted pH 1. The solutions were titrated with a 0.025 M EDTA solution containing 6 M lithium choloride. The tetrachloroferrate (III) selective electrode was used to indicate the end point. Potentiometric titration with the tetrachloroferrate (III)-selective electrode provides a rapid control of the total chloride ion concentration in solution and can be done in strongly acidic solutions (pH 1). (Hoyle-Vanderbilt)
W76-02894

SIMPLE TRACE DETERMINATION OF PLATINUM IN GEOLOGICAL MATERIALS,
E. L. Kothny.
Journal of Geochemical Exploration, Vol 3, No 3, p 291-299 July 1974. 3 tab, 1 fig, 22 ref.

Descriptors: *Heavy metals, *Trace elements, *Analytical techniques, *Spectrophotometry, *Platinum, Geochemistry, *Pollutant identification.
Identifiers: *Acid leachates.

A direct, sensitive and simple method for the determination of sub-microgram amounts of platinum in acid leachates from geological materials is described. Operations involved in this method eliminate interfering elemets such as C, S, Hg, Se, Te, and As, and eventually form a precipitated red quaternary complex which is suitable for spectrophotometric determination for platinum. The sensitivity corresponds to 0.01 microgram per ml of Pt. A test procedure is described for serial analysis of 1-3 g powdered samples which enables an operator to perform from 30 to 50 analyses per man-day in the concentration range of 0.1-17 ppm platinum. The procedure has been validated against standard samples and a recovery of 90% has been obtained with unspiked samples. (Hoyle-Vanderbilt)
W76-02895

A SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF RHENIUM IN GEOLOGIC MATERIALS,
Kennecott Exploration, Inc., Salt Lake City, Utah.
E. J. Mahaffey.
Journal of Geochemical Exploration, Vol 3 No 1, p 53-59, March 1974. 2 tab, 1 fig, 16 ref.

Descriptors: *Heavy metals, *Geochemistry, *Spectrophotometry, *Analytical techniques, Silicates, Brines, *Pollutant identification.
Identifiers: *Rhenium, *Ores.

Existing methods for the chemical determination of rhenium have been modified and adopted for the analysis of rock, sediment, water, brine, and mineral concentrates. The new method can be applied on the determination of rhenium in uranium oxide ore, manganese nodules, plant ash, potash ore, silicate rocks, sulfide concentrates, and water samples. Little restriction is placed on sample size, but usually between 0.1 g and 100 g of solid sample is used which contains between 1 and 200 micrograms of rhenium giving a detection limit of 10 ppb in the sample. Several liters of water may be used giving a detection limit of less than 1 ppb. The spectrophotometric method concentrates and isolates the rhenium from the samples by using carbon adsorption and solvent extraction. (Hoyle-Vanderbilt)
W76-02896

A STUDY OF MINNESOTA FORESTS AND LAKES USING DATA FROM EARTH

RESOURCES TECHNOLOGY SATELLITES, TWENTY-FOUR MONTH PROGRESS REPORT.
Minnesota Univ., Minneapolis. Space Sciences Center.
For primary bibliographic entry see Field 4A.
W76-02901

EVAULATION OF WATER QUALITY BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., St. Paul. Dept. of Forest Biology.
A. C. Mace, Jr.
In: A Study of Minnesota Forests and Lakes Using Data from Earth Resources Technology Satellites; Twenty-four Month Progress Report, Minnesota University, Minneapolis, Space Science Center, p 19-37, June 30, 1974. 7 fig, 4 tab, 3 ref. NASA NGL 24-005-263.

Descriptors: *Remote sensing, *Aerial photography, *Water quality, *Minnesota, Phytoplankton, Chlorophyll, Secchi disks, Turbidity, Eutrophication, Evaluation, Photography, Films, Filters, Aquatic plants, Effluents, Sewage effluents, Waste water disposal, Nutrients.
Identifiers: *Lake Minnetonka(Minn).

A multispectral overflight as scales of 1:3000 and 1:6000 using 70 mm and 35 mm photography was made over Lake Minnetonka in late August 1973, to evaluate water quality parameters, particularly primary productivity. Analysis of the relationships of 2402 Plus-X Aerographic/Wratten 25 film/filter combination negative film densities to phytoplanktons, secchi disc depth, and estimated chlorophyll concentrations indicated a significant correlation. Prediction equations were developed for these relationships. Correlations of other film/filter combinations with these water quality variables were not successful. Differentiation of some aquatic vegetations species by film density measurements was possible with all film/filter combinations. (See also W76-02901) (Sims-ISWS)
W76-02903

REMOTE SENSING IN LAKE SUPERIOR STUDIES,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2H.
W76-02908

VARIATIONS IN THE NATURAL CHEMICAL CONCENTRATION OF RIVER WATER DURING FLOOD FLOWS, AND THE LAG EFFECT: SOME FURTHER COMMENTS,
Exeter Univ. (England). Dept. of Geography.
D. E. Walling, and I. D. L. Foster.
Journal of Hydrology, Vol 26, No 3/4, p 237-244, August 1975. 3 fig, 2 tab, 7 ref.

Descriptors: *Chemical properties, *Correlation analysis, *Flood flow, Flood routing, Flood peak, Flow characteristics, Hydrographs, Soil moisture, Pollutant identification, Streamflow, Storm runoff, Hydrology, Specific conductivity, Time lag, Water chemistry, Calcium, Magnesium, Sodium, Potassium.
Identifiers: *Chemographs, *Devon(Great Britain).

Results from several Devon catchments were used to demonstrate the complexity of variations in the chemical concentration of river water during flood flows. Certain solute species increased rather than decreased in concentration during storm events and the 'chemographs' of those species which exhibited dilution were often complicated by a 'flushing effect'. Some solutes exhibited variable response, evidencing increased and decreased concentrations during different events. Even in small catchments, 'chemograph' response can lag behind streamflow response and examples have been documented where the trough precedes the streamflow peak. Values of 'chemograph' lag between zero and 14.5 hours were found at a gaging station on the Devon River. This variation in lag time was tentatively explained in terms of catchment moisture status. A multivariate relationship was developed between 'chemograph' lag and four hydrologic variables: hydrograph rise, preceding flow level, soil moisture deficit, and a seasonal index. (See also W75-00320) (Harmeson-ISWS)
W76-02916

NONPOINT SOURCE MINERAL WATER QUALITY MODEL,
Tennessee Valley Authority, Knoxville. Hydraulic Data Branch.
For primary bibliographic entry see Field 5B.
W76-02922

REPORT ON INVESTIGATION OF WATER QUALITY OF CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
For primary bibliographic entry see Field 5B.
W76-02931

GROUND-WATER RESOURCES OF AMERICAN SAMOA WITH EMPHASIS ON THE TAFUNA-LEONE PLAIN, TUTUILA ISLAND,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 4B.
W76-02950

EFFECTS OF ORGANIC SOLUTES ON CHEMICAL REACTIONS OF ALUMINUM,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-02953

SOME LIMNOLOGICAL ASPECTS OF 20 SELECTED LAKES IN EAGAN AND APPLE VALLEY, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 2H.
W76-02966

OIL-SPILL DETECTION SYSTEM,
Texaco Inc., New York. (Assignee).
G. H. Miller, and E. O. Renick, Jr.
U.S. Patent No 3,916,674, 5 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 95, November 4, 1975.

Descriptors: *Patents, *Oil pollution, *OIL spills, *Pollutant identification, Water pollution control, Skimming, Monitoring, Measurement, Equipment.

A system for detecting oil spills on a body of water comprises, in combination, a stainless-steel rotatable disc, and buoyant means for supporting the disc partially submerged in a body of water while it is floating on the surface. The system also has surface-water flow-directing wings attached to the buoyant means for directing movement of surface water to the vicinity of the disc, and means for rotating the disc about its axis. The system also has a doctor blade above the surface of the body of water for removing liquid adherents including any oil floating on the water surface and channel means associated with the blade for directing the adherents into a sediment settling vessel having an outlet which directs the adherents into an upstanding tubular container having electrically insulating interior walls. A pair of electrically conducting plates mounted diametrically opposite one another forms a capacitor with the adherents filling the space between. The system also has air-bubble inlets and outlets on a turbulence chamber for passing bubbles to prevent settling of fine solids. An electrical bridge circuit means include an indicator for indicating the presence of oil in the adherents by measuring the change in capacitance in the capacitor. (Sinha-OEIS)
W76-02996

5B. Sources Of Pollution

EFFECT OF GEOGRAPHICAL VARIATION ON PERFORMANCE OF RECIRCULATING COOLING PONDS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
E. L. Thackston.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-660/2-74-085, November 1974. 239 p, 138 fig, 92 tab, 13 ref, 4 append. 16130-FDQ. R-800613.

Descriptors: Ponds, Cooling, *Heat transfer, *Recirculated water, *Energy budget, *Thermal pollution, Water temperature, Temperature, Thermal powerplants, Mathematical models, United States, Geographic regions, Meteorology.
Identifiers: *Cooling ponds, Heat transfer coefficient, Equilibrium temperature, Geographic variation.

The energy budget approach to cooling ponds has been outlined and applied to closed cycle, recirculating cooling ponds. Monthly average weather data from 88 stations throughout the U.S. were used to calculate equilibrium temperature, heat exchange coefficients, and the average temperature of various sized ponds receiving the effluent from a standard power plant of 1000-mw capacity, both for average and extreme weather conditions. The data for each station are shown on a separate chart, and the variation of these results across the U.S. is depicted by a series of 38 maps of the U.S., with contours connecting equal values of the parameters. The results may also be used to estimate cooling pond performance for other sized power plants and other sized ponds. The maps disclose variations across the U.S., on a given date, of up to 55F in equilibrium temperature, up to 100% difference in heat exchange coefficients, and up to 50F difference in pond temperatures. Increase of pond temperature over equilibrium is greater in winter than in summer. (EPA)
W76-02501

SESTON AND PERIPHYTON OF THE RIVER VISTULA ON THE SECTOR FROM NOWY BIERUN TO THE WATER STAGE AT LACZANY AND ON THE LACZANY: SKAWINA CANAL (IN POLISH),
Polish Academy of Science, Krakow. Zaklad Ochrony Przyrody.
M. Hanak-Schmager.
Acta Hydrobiol, Vol 16, No 3/4, p 345-364, 1974. Illus.

Descriptors: *Rivers, Europe, *Seston, *Plankton, Zooplankton, Epiphyrology, Tubificids, Aquatic life, Nematodes, *Water pollution sources, *Self-purification, Bacteria, *Microorganisms.
Identifiers: Bacillariophyceae, Chlorophyceae, Chrysophyceae, Ciliata, Cladocera, Copepoda, Cyanophyceae, Flagellata, Heterokontae, Laczany River, Myxomycetes, Nematodes, Nowy-Bierun, Periphyton, *Poland, Pyrrophyta, Rotatoria, Rotifera, Schizomycetes, Skawinacanal, Suctoria, Testacea, Tubificidae, Vistula River, Phyto-seston.

The material for investigation was collected from the River Vistula (Poland) on the sector from Nowy Bierun to the water stage at Laczany, from the Laczany-Skawina Canal, and once from the River Przemsza (Poland) before its confluence with the River Vistula. Samples were collected from July-Oct. 1970. Three communities, phyto-seston, zooplankton and epiphytic associations, were elaborated. Altogether 374 taxons were identified tinguished, of which 41 belonged to Cyanophyceae, 22 to Flagellata, 3 to Pyrrophyta, 6 to Heterokontae, 8 to Chrysophyceae, 162 to Bacillariophyceae, 80 to Chlorophyceae, 14 to Schizomycetes and Myxomycetes, 7 to Ciliata, 1

to Suctoria, 20 to Rotatoria, 8 to Cladocera, 2 to Copepoda; various unidentified Testacea, Nematodes, and Tubificidae were also included. The examined sector of the river was characterized with respect to the pollution level, which was determined on the basis of the list of species and numerical data of the Pantle-Buck index. With the course of the river an increase in the self-purification process was found, this being influenced positively by a high water level (flood waters).--Copyright 1975, Biological Abstracts, Inc.
W76-02513

FOR A MORE COMPLETE UTILIZATION OF SULFITE AND SULFATE SPENT LIQUORS AND PREHYDROLYZATES (POLNEE ISPOL'ZOVAT' SUL'FITNYE, SUL'FATNYE SHCHELOKA I PREDGIDROLIZATY),
Gosudarstvennaya Planovaya Komissiya, Moscow (USSR).
V. I. Kropotov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 4, p 2-4, 1975.

Descriptors: *Sulfite liquors, *Pulp wastes, *Byproducts, Alcohols, Yeasts, Proteins, Water pollution sources, Wastes, Industrial wastes, Water pollution control, Pulp and paper industry, Chemicals, Hydrolysis.
Identifiers: Soviet Union(USSR), Kraft mills, Sulfite pulp mills, Sulfite alcohol, Tall oil, Ethanol(Ethyl alcohol), Hydrolyzates, Wood hydrolysis, Silvichemicals.

Statistical data are presented on the overall production of sulfite alcohol and feed yeast at sulfite mills and of tall oil chemicals at kraft mills for the period 1960-1974. The utilization of spent pulping liquors and wood prehydrolyzates at individual Soviet mills is discussed. Many mills place top little emphasis on the development of the by-product industry. The rate of growth is especially low for the production of sulfite alcohol. It is suggested that the organization by the technical societies and the Ministry of the Pulp and Paper Industry of exchange of information between the mills (through meetings, seminars, etc.) would encourage the mills to better develop their potential for the production of these valuable products and help to meet production goals for the current year and the near future. (Stapinski-IPC)
W76-02516

PREDICTING EFFECTS ON FISH OF FIRE RETARDANTS IN STREAMS,
Forest Service (USDA), Ogden. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 5C.
W76-02519

CLEARCUTTING AND BURNING SLASH ALTER QUALITY OF STREAM WATER IN NORTHERN IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-02522

CONVERSION OF CHAPARRAL TO GRASS IN CENTRAL ARIZONA: EFFECTS ON SELECTED IONS IN WATERSHED RUNOFF,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
D. J. Longstreth, and D. T. Patten.
American Midland Naturalish, Vol 93, No 1, p 25-34, January 1975. 3 fig, 1 tab, 27 ref.

Descriptors: *Watershed management, *Surface runoff, *Nutrient removal, *Nitrates, *Chaparral, Grasses, *Arizona, Nutrients, Chemical analysis, Nitrification, Ions, Ecosystem, Range management, Root systems.
Identifiers: Mazatzal Mountains(Ariz).

Concentrations and temporal patterns of silica, Ca(++), Mg(++), K(+), Na(+), SO4(--), C1(-), NO3(-), total-PO4(--) and ortho-PO4(--) in runoff waters from two watersheds in the Mazatzal Mountains of central Arizona were compared. Water discharge from the watershed converted to perennial grass cover by the U.S. Forest Service was over four times that from the chaparral-dominated watershed. Ionic concentrations were similar with the exception of nitrate concentrations which reached values of over 4mg/liter from the grass-covered watershed, while that from the chaparral watershed was rarely above the limits of detection. This was attributed to the effect of deep-rooted chaparral on the microclimate of the soil. It was concluded that for any hydrological change in a chaparral watershed ecosystem, there is a concomitant change in nutrient cycles, which is seen as important in terms of applicability to management practices. (Mills-Arizona)
W76-02527

CHEMICAL RUN-OFF IN CATCHMENTS CONVERTED TO AGRICULTURAL USE,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Ecology Div.
R. H. S. McColl, E. White, and J. R. Waugh.
New Zealand Journal of Science, Vol 18, No 1, p 67-84, March 1975. 4 fig, 8 tab, 13 ref, append.

Descriptors: *Path of pollutants, *Fertilizers, *Water pollution, *Phosphorus, *Phosphates, *Water quality, Water pollution sources, Agriculture, Chemicals, Fertility, Fertilization, Nitrates, Nitrogen compounds, Phosphorus compounds, Topsoil, Watersheds(Basins), Eutrophication, Nutrients, Pasture management, Pastures, Calcium, Magnesium, Potassium, Lime.
Identifiers: Superphosphate.

The conversion of land to agriculture and the use of fertilizers result in an increase of the nutrient content of run-off waters, and may lead to deterioration of water quality in streams and eutrophication of lakes. This study examines the changes in water quality which took place when an experimental catchment was converted from manuka (Leptospermum scoparium) scrub to pasture, and the quantities of nutrients lost in floods before and after the application of lime and superphosphate fertilizers. Estimated losses of applied fertilizer were as high as 2.8 percent for Ca, 22.9 percent for Mg, and 19.9 percent for K. Phosphorus was the least mobile fertilizer component with losses from the smallest catchment in the first and second post-fertilizer floods of 1.4 and 0.55 percent respectively. In the two larger catchments no losses of soluble phosphorus attributable to fertilizer treatment were found. Removal of P by the stream bed or adsorption on to suspended particulate material seems likely. Although the fertilizer contained no nitrogen, some losses of nitrate and ammonia N seemed due to fertilizer treatment. Large sulfate losses were apparently due to fertilizer treatment, but may have been partly related to solution of exposed rocks high in sulfide. P levels leaving the experimental catchments were less than those found in many natural catchments. In low-fertility areas added P may be almost totally trapped within the system. (Robinett-Arizona)
W76-02528

THE EFFECTS OF CURRENTS AND WAVES ON AN OIL SLICK RETAINED BY A BARRIER,
Texas A and M Research Foundation, College Station.
For primary bibliographic entry see Field 5G.
W76-02549

HEAT DISPOSAL IN WATER ENVIRONMENT,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
D. R. F. Harleman.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY9, Proceedings Paper 11585, p 1117-1138, September 1975. 11 fig, 21 ref, 2 append.

Descriptors: *Hydraulic models, *Thermal pollution, *Nuclear powerplants, *Thermal stratification, *Heat balance, Mathematical models, Hydraulic jump, Hydraulics, Waste disposal, Heated water, Discharge(Water), Waste water disposal, Powerplants, Diffusion, Water temperature, Buoyancy, Jets.
Identifiers: *Buoyant jets, *Surface impingement, *Diffusers, Thermal diffusion.

The need for continuing development of techniques for predicting temperature distributions due to waste heat discharges into lakes, rivers, estuaries, and the oceans was presented. Diffusion of buoyant jets was examined, including heated surface jets and multiple jets issuing from a submerged multiport diffuser. In the near-field analysis of surface jets, the important problems were related to the lateral spreading caused by buoyancy. Comparison of theoretical predications with laboratory and field observations were given. The mechanics of multiport diffusers for heated discharges in shallow receiving waters were explained in contrast to sewage diffusers. The important problem is the degree to which stratification can be maintained in order to minimize local reentrainment and reduction of dilution capacity. Criteria for stable and unstable flow regimes were provided. A mathematical model for temperature distribution, with or without waste heat addition, in unsteady flows under time-varying meteorological conditions was given. (Lardner-ISWS)
W76-02559

EQUILIBRIUM ADSORPTION OF INORGANIC PHOSPHATE BY LAKE SEDIMENTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5C.
W76-02562

LARGE SYSTEMS APPROACH TO WATER QUALITY MODELLING AND MANAGEMENT,
Texas Univ. at Austin.
B. R. Penumalli.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No 75-16,722. PhD Thesis, 1975, 234 p.

Descriptors: *Water quality, Analytical techniques, Numerical analysis, Estuaries, Water resources development, *Model studies, Water management(Applied), Cost analysis, *Texas, Bays.
Identifiers: *Corpus Christi Bay(Tex), Matrix model.

A large systems approach to the problem of estuarine water quality modelling and management is discussed. Analytical techniques of solutions of the hydrodynamic and transport equations, which are fundamental to estuarine water quality modeling, become intractibel. Numerical techniques are discussed. The problems are mostly highly dimensional and suit themselves well to matrix models with a simple structure. An error correction algorithm is developed and used to solve the matrix model. The accuracy of the solution is judged by an analytical calibration criterion and an error analysis method. The approaches developed have been applied to the Corpus Christi Bay on the Gulf Coast of Texas. An existing hydrodynamic model for the area has been modified for the study to obtain the necessary hydrodynamics for the water model. Two types of models were used with field data. The objective of this study was minimization of the total cost of treatment and variables of optimization, and a generalization of standard water quality. (Pinto-FIRL)
W76-02564

DISTRIBUTED PARAMETER SYSTEMS APPROXIMATION FOR ESTUARINE WATER QUALITY MODELLING AND CONTROL,
Texas Univ. at Austin.
B. J. Olufeagba.
Available from University Microfilms Inc., Ann Arbor, Mich. 48106. Order No 75-16,718. Ph.D. Thesis, 1975, 330 p.

Descriptors: *Water quality, *Water management(Applied), *Mathematical models, Dissolved oxygen, Coliforms, Nitrification, Treatment facilities, Water pollution control, *New York, Path of pollutants.
Identifiers: *Jamaica Bay(NY).

Water quality in an estuary was described by a set of coupled distributed parameter systems. Both long term and short term effects for Jamaica Bay, New York, were investigated. Short term water quality was described by a system of coupled mixed initial boundary value dispersion-advection evolution equations. A method was developed using a stepwise convergent technique. Results of a semi-linear multi-constituent model for the biota and nitrogen cycle indicated that the biota did not satisfy the hypothesis of immotility. For long term water quality effects, a mixed Dirichlet-Neumann elliptic boundary value problem in two spacial dimensions was satisfied, and the effects were reduced to a set of coupled multi-point boundary value problems for ordinary differential equations. Long term control problems, involving coliform and dissolved oxygen were studied in order to calculate optimal management policies for the Jamaica Bay area. An algebraic representation was developed for the dissolved oxygen concentration at specific points in the bay as a function of the treatment levels at water pollution control facilities discharging into the bay. Three management policies for achieving the DO standard for 1980 were proposed, as calculated by defining the optimal nitrification at each of four treatment plants in the Bay. (Kramer-FIRL)
W76-02565

GROWTH KINETICS OF HETEROGENEOUS MICROBIAL POPULATIONS AND THE MODELLING OF BIOLOGICAL WASTE TREATMENT REACTORS,
Toronto Univ. (Ontario).
For primary bibliographic entry see Field 5D.
W76-02566

A SIMULATION MODEL FOR STUDYING EFFECTS OF POLLUTION AND FRESHWATER INFLOW ON SECONDARY PRODUCTIVITY IN A ECOSYSTEM,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 5C.
W76-02567

HEAVY METALS IN WATERS AND SOIL ASSOCIATED WITH SEVERAL PENNSYLVANIA LANDFILLS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5A.
W76-02569

OXFORDSHIRE WASTE SURVEY INTERIM RESULTS.
For primary bibliographic entry see Field 5E.
W76-02589

CHARACTERISTICS OF THE RADIATION CONDITIONS OF DEVELOPMENT OF EGGS OF FRESHWATER FISHES BELONGING TO DIFFEENT ECOLOGICAL GROUPS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5C.
W76-02615

THE OXIDATION OF URIC ACID BY IODINE IN AQUEOUS SOLUTION,
North Dakota State Univ., Fargo. Dept. of Chemistry.
F. Rathmann.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 078, $4.00 in paper copy, $2.25 in microfiche. North Dakota Water Resources Research Institute, Fargo, Report No WI-221-030-75, April, 1975. 29 p, 11 fig, 3 tab, 27 ref. OWRT A-018-NDAK(1). 14-01-0001-1402, 14-01-0001-1854, 14-31-0001-3034.

Descriptors: *Oxidation, *Kinetics, Ions, Chemical reactions, *Chlorination, Model studies, *Iodine, Urine, Acids, Aqueous solutions, Spectrophotometry, Temperature, Hydrogen ion concentration.
Identifiers: *Uric acid.

A kinetic study of the consumption of iodine by uric acid was undertaken to determine reactive intermediates in the oxidation of uric acid. The system was chosen as a practical and closely analogous model for the oxidation in uric acid by chlorinated waters. Rates were followed spectrophotometrically and were measured as a function of pH, temperature and initial concentration. It is concluded that the most important reactive intermediate in the oxidation is the monourate ion.
W76-02632

INFLUENCE OF LAND DEVELOPMENT AND LAND USE PATTERNS ON WATER QUALITY,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
C. D. Gates, and D. A. Haith.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 071, $5.00 in paper copy, $2.25 in microfiche. Cornell University Water Resources and Marine Science Center, (1975). 79 p, 20 tab, 5 fig. OWRT A-062-NY(1). 14-31-0001-5032.

Descriptors: Agricultural runoff, *Agricultural watersheds, Nutrients, Regression analysis, Surface runoff, *Water pollution sources, Nitrogen, Phosphorus, *Water quality, *Land use, *Land development.
Identifiers: Broome County(NY), Cayuga Lake(NY), Nonpoint pollution sources, Susquehanna River, Tioga County(NY).

Field, laboratory and statistical methods were used to study the influence of certain land uses on the waterborne export of certain wastes from a sewered urban area and from unsewered rural watersheds. Comparison, by means of mass balance analysis of the amounts of biodegradable wastes in the Susquehanna River at stations above and below a 20.6 square mile developed area in Broome County, N.Y. indicated that the study area contributed carbonaceous BOD5 at the rate of 390 pounds per day per square mile to the River, averaged over the June-August 1973 and 1974 periods. The nature of the relationship between land use in and plant nutrient outputs from eighteen rural watersheds in the Cayuga Lake Basin was studied through use of regression analysis. The development of regression equations for nitrate and phosphate outputs from individual watersheds did not lead to the development of unambiguous quantitative relationships between land uses and nutrient concentrations. A rational procedure for analyzing nonpoint source pollution, developed from the U.S. Soil Conservation Service semi-empirical runoff equation, was used to estimate non-point source phosphorus and nitrogen inputs from a 578 km2 watershed in Broome and Tioga Counties in New York State. It was concluded that nonpoint sources of nitrogen and phosphorus were not significant in the study area.
W76-02637

UPPER YELLOWSTONE RIVER WATER QUALITY: AUGUST 1973 - AUGUST 1974,
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
R. V. Thurston, R. J. Luedtke, and R. C. Russo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 072, $4.50 in paper copy, $2.25 in microfiche. Research Report No 68, Montana University Joint Water Resources Research Center, Bozeman, August 1975. 57 p, 14 fig, 22 tab, 20 ref, append. OWRT A-081-MONT(1).

Descriptors: *Water quality, *Water pollution sources, *Water chemistry, *Invertebrates, *Montana, Watershed management, Water analysis, Monitoring, Pollutant identification.
Identifiers: *Yellowstone River(Mont).

The Yellowstone River in Montana upstream from the town of Laurel is a relatively non-polluted free-flowing river, used for both recreational and agricultural purposes. Consideration has been given to the feasibility of a storage reservoir above the city of Livingston. Because of the current and possible future uses of this section of the river, a record of water quality is important as baseline data, as well as providing information for watershed management. The water chemistry and macroinvertebrate distribution of the upper Yellowstone River, Montana, were studied between August 1973 and August 1974. Samples were collected at seven stations between Corwin Springs and Laurel on six occasions for macroinvertebrate determinations and on eight occasions for water analyses. No significant water quality degradation was evident from the water chemistry analyses. A small change in the macroinvertebrate species composition was noted along the river course.
W76-02638

SEVERAL CONTRIBUTIONS TO THE EVALUATION OF THE DISSOLVED CARBON DIOXIDE CONTENT OF DANUBE WATER, (IN GERMAN),
E. V. Kozma.
Ann Univ Sci Budap Rolando Eotvos Nominatae Sect Biol. 16: 45-52, Illus. 1974.

Descriptors: *Rivers, *Carbon dioxide, Algae, Phytoplankton, *Chemical analysis, Seasonal, Absorption.
Identifiers: *Danube River, *Hungary.

Between 1965-1971, 420 samples were taken from km 1669 of the Danube river in Hungary. The C ion content varied between 22-69 mg/1; significantly higher that the theoretical 5-6 mg/l. O2 content was highest in winter and lowest in summer. This correlated with the algal population size which ranged from 8-25 million specimens/1 in winter to 1000-1,000,000 specimens/1 in summer. Dissolved CO2 never occurred above pH 8.1 and it did not coincide with dissolved O2. These findings emphasize the importance of the assimilatory activity of phytoplankton.--Copyright 1975, Biological Abstracts, Inc.
W76-02661

STRIP MINING AND RECLAMATION ON THE BLACK MESA OF ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5G.
W76-02670

PHOSPHORUS SORPTION AND DESORPTION IN CALCAREOUS SOILS FROM ARIZONA,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2G.
W76-02677

STATUS MEMORANDUM ON CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
Status Report, March 1974. 69 p, 16 fig, 26 photo, 23 tab, 8 ref.

Descriptors: *Water quality, *Runoff, *Surveys, *Minnesota, Water pollution sources, Water pollution, Path of pollutants, Pollutants, Pollutant identification, Watersheds(Basins), Lakes, Surface waters, Domestic animals, Farm wastes, Nutrients, Eutrophication, Aquatic plants, Erosion, On-site investigations.
Identifiers: *Christmas Lake(Minn).

Christmas Lake has a surface area of 260 acres roughly triangular in shape. It is located in both Carver and Hennepin Counties, Minnesota. The watershed is small, with an area including the lake of approximately 410 acres. There are three inflowing tributaries to Christmas Lake, of which Christmas Lake Creek entering from the southwest is most important with regard to flow and nutrient influx. The runoff which has been observed from Twin Hills Farm, County Road 17 and West 62nd Street, indicated that amounts of phosphorus in excess of the effluent standard are being introduced into Christmas Lake. The effect of these nutrients was observed as an extensive population of aquatic macrophytes (i.e., larger plants) in the region of the confluence of those point sources with the lake. This memorandum covered tributary sampling; nutrient contributions from soil erosion and pasture runoff; effects of tributary runoff on lake sediments; macrophyte (rooted aquatic plant) nutrient uptake; and additional biological, chemical, and physical data on the limnology of Christmas Lake. This is a status report and interpretation of data gathered from April 25 through November 21, 1973. (Sims-ISWS)
W76-02682

ANALYSIS OF THREE YEARS OF COMPLETE-FIELD TEMPERATURE DATA FROM DIFFERENT SITES OF HEATED SURFACE DISCHARGES INTO LAKE MICHIGAN,
Argonne National Lab., Ill.
J. M. Kyser, R. A. Paddock, and A. J. Policastro.
Available from the National Technical Information Service, Springfield, Va 22161, as CONF-740820 3, $5.45 in paper copy, $2.25 in microfiche. For presentation at: IAEA Symposium on Physical and Biological Effects on Environment of Cooling Systems and Thermal Discharges at Nuclear Power Stations, Oslo (Norway), August 26-30, 1974. 55 p, 33 fig, 5 tab, 9 ref. ERDA W-31-109-ENG-38.

Descriptors: *Heated water, *On-site data collections, *Lake Michigan, Illinois, Wisconsin, Indiana, Michigan, Thermal powerplants, Water temperature, Instrumentation, On-site investigations, Measurement, Analysis, Distribution patterns, Dispersion, Discharge(Water), Currents(Water), Lakes, Isotherms, *Thermal pollution.
Identifiers: *Temperature decay, *Thermal plumes, Two Creeks(Wis), South Haven(Mich), Hammond(Ind), Waukegan(ILL).

Temperature data taken from prototype thermal plumes from single (and, in one case, double) surface outfalls under varying environmental conditions were systematically analyzed. Three-dimensional temperature data were taken at four sites on Lake Michigan (Palisades, Point Beach Unit 1, Point Beach Units 1 and 2, Waukegan, and State Line) by an instrument-equipped boat. Of most significance to plume dispersion at these sites were current speed and direction, wind speed and direction, and ambient lake turbulence. Plume characteristics of centerline temperature decay, temperature half-widths, and isotherm areas showed wide variation at a site as environmental conditions changed from one plume to the next. The palisades and Point Beach Unit 1 data each fit into 5 categories distinguished by ranges in current, wind, and lake conditions. The Waukegan site demonstrated the most rapid plume dilution in terms of centerline temperature decay and isotherm areas due to its large outfall densimetric Froude Number (about 9.7). The State Line site with its low initial densimetric Froude Number (about 1) showed the least rapid plume dispersion. The Point Beach Unit 1 and Palisades discharges, although having nearly equal heat-rejection rates and ititial densimetric Froude Numbers (about 2.4), had significantly dif fering plume characteristics due to the large outfall aspect ratio difference and secondarily upon the magnitude of site-dependent ambient currents. The Palisades plumes had a generally slower centerline temperature decay and larger areas than Point Beach due mainly to its much larger aspect ratio. (Humphreys-ISWS)
W76-02683

HORIZONTAL SPREAD OF WASTEWATER FIELD OVER CALM OCEAN SURFACE,
Montgomery Inc., Pasadena, Calif. M. James.
J. L. Chao.
Journal Water Pollution Control Federation, Vol 47, No 10, p 2504-2510, October 1975. 2 fig, 18 ref.

Descriptors: *Theoretical analysis, *Fluid mechanics, *Waste water disposal, Mixing, Equations, Velocity, Dispersion, Effluents, Discharge(Water), Momentum equation, Continuity equation, Jets, *Waste dilution, Oceans, Outlets, *Path of pollutants, Water pollution.
Identifiers: *Ocean outfalls, Radial wall jets, Stream function.

The horizontal spread of the wastewater field, after the effluent from a submerged outfall has reached the ocean surface, was treated as a radial wall jet. The boundary layer approximations were used and a similarity assumption was made to obtain the velocity distribution in the spreading surface layer. The physical dilution which resulted from the horizontal spreading was derived. An example demonstrated that the dilution from horizontal spreading is much less than the initial dilution in the rising bouyant effluent plume. (Adams-ISWS)
W76-02687

REVIEW OF MODELS OF TIDAL WATERS,
Monash Univ., Clayton (Australia), Dept. of Mechanical Engineering.
J. B. Hinwood, and I. G. Wallis.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY11, Proceedings Paper 11693, p 1405-1421, November 1975. 1 ref.

Descriptors: *Model studies, *Reviews, *Water quality, *Estuaries, *Waste water disposal, Dispersion, Environmental engineering, Hydrodynamics, Tidal waters, Numerical analysis, Water pollution, Hydraulics, Mathematical models, Inlets(Waterways), *Path of pollutants, Wastes, Water quality.
Identifiers: *Eulerian models, Waste concentration, Transport models.

Approximatetly 100 models of water and waste movement in tidal bays and estuaries have been reviewed, and their predictive capability and limitation have been examined. The review provided detailed analysis of different models within the same classification. Water quality models predict the concentration of contaminants as a function of time and position in the estuary. Zero-dimensional models are used to predict the concentration field, one-dimensional Eulerian models give an accurate description of waste concentration and movement in a long well-mixed estuary; one-dimensional non-Eulerian models have resulted in the development of transport models; two-dimensional models represent the longitudinal and lateral movement of wastes, transport models based on the vertically integrated conservation of mass equation; and three-dimensional models allow the complete spatial distribution of the waste field to be predicted. By using this review in conjunction with the classification scheme and the selection of questions, the most appropriate model for a particular task may be predicted. (Singh-ISWS)
W76-02689

WIND EROSION OF HEATED SURFACE LAYER,
Delaware Univ., Newark, Coll. of Marine Studies.
J. Wu.
Water Research, Vol 9, No 11, p 1005-1007, November 1975. 3 fig, 10 ref.

Descriptors: *Wind velocity, *Heated water, *Thermal pollution, *Dispersion, *Entrainment, Boundary layers, Condensers, Turbulence, Mixing, Heat balance, Temperature, Discharge(Water), Path of pollutants.
Identifiers: *Thermal plume, Ambient temperature.

In the once-through cooling system, water at ambient temperature is withdrawn from the natural body of water, pumped through the condensers, and returned to the water body at higher temperatures. Thermal pollution problem necessitates understanding the behavior of heated water discharge and predicting its dilution by ambient water and heat dissipation into the air. The dilution and dissipation can be roughly divided into: a thermal plume near ejection site, a thermal current at near field, and a nearly well-mixed region at far field. Intensive entrainment at the interface of heated surface layer and ambient water occurs because of relative motion and turbulence. Wind stress was shown to introduce significant thickening of the heated surface layer due to entrainment at the lower layer boundary. The thickening of, and the mixing within, the surface layer causes a reduction in the surface temprature; the heat loss to the air through conduction may therefore be reduce. (Singh-ISWS)
W76-02690

GROUNDWATER POLLUTION CONTROL IN AN INDUSTRIALIZED PART OF THE TRENT BASIN,
Trent River Authority (England).
For primary bibliographic entry see Field 5G.
W76-02691

STUDY OF RIVER POLLUTION CAUSED BY MICROPOLLUTANTS,
Research Inst. for Water Resources Development, Budapest (Hungary).
P. Literathy.
Water Research, Vol 9, No 11, p 1001-1003, November 1975. 2 fig, 3 tab, 8 ref.

Descriptors: *Pollutant identification, *Water pollution sources, Rivers, *Oil pollution, *Heavy metals, Pollutants, Water quality, Analytical techniques, Chemical analysis, Water pollution, Surface waters, Organic wastes, Oil, *Phenols, Oil wastes, Organic compounds, Chemical wastes, Lipids, Sediments, Infrared radiation, Ultraviolet radiation, Spectrophotometry.
Identifiers: *River pollution, *Micropollutants, *Danube River(Hungary), Petroleum derivatives, Phenol derivatives, Budapest(Hungary).

Of the polluting substances present in surface waters greatest importance is attributed to the micropollutants. Concerning the water quality of the Danube river, among the micropollutants, special attention should be devoted to the petroleum and phenol derivatives, further to some heavy metals (mercury, zinc, etc.). Phenolic compounds in the low concentrations encountered are readily soluble in water, so that they are present in small quantities only in the suspended solids and in the bottom sediment. Petroleum derivatives and fats

are of great importance in this respect together with some heavy metals, which tend to absorb to the suspended solids, respectively to form precipitates and thus to settle to the bottom. The investigations on quality variations were carried out over a Danube section upstream of Budapest. This section offers a model opportunity for studying changes in the pollutants tending to separate and form precipitates in water, the settling thereof as a function of flow conditions and time, etc. These investigations have offered an explanation for the 'disappearence' of the persistent substances, which has been observed during the regular water analyses. The results of analyses performed on the water as well as on the bottom sediment were discussed. (Henley-ISWS)
W76-02692

AGRICULTURAL RUNOFF POLLUTES SURFACE WATERS, PART I,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
L. L. Harms, P. Middaugh, J. N. Dornbush, and J. R. Andersen.
Water and Sewage Works, Vol 122, No 10, p 84-85, October 1975. 2 tab. EPA R-800400.

Descriptors: *Water pollution sources, *Agricultural runoff, *South Dakota, *Water quality, On-site investigations, Agricultural watersheds, Sampling, Surface runoff, Rainfall, Snowmelt, Bacteria, Coliforms, Streptococcus, Vegetation effects, Oats, Corn(Field), Pastures, Alfalfa, Bromegrass, Soil texture, Loam.
Identifiers: Bacteriological quality, Sandy clay.

Published title is in error. Title should be 'Bacteriological Quality of Surface Runoff From Agricultural Land, Part 1.' Data collected during a recent two-year study of surface runoff from 91 snowmelt and 32 rainfall events from seven sites in eastern South Dakota indicated that runoff from agricultural lands may be a significant source of pollution for surface waters. Agricultural runoff is a non-point source of water pollution; consequently, it is virtually uncontrollable. The data presented pertain only to surface runoff from agricultural land and were collected to obtain information regarding the densities of the bacteriological indicator organisms in surface runoff and relate these densities to water quality criteria that would apply to the receiving waters. All field conditions were natural and uncontrolled. General site information for drainage area, crop cover, and soil texture were tabulated. Samples were taken periodically throughout each runoff event, and a single composite sample was made from the individual samples for a particular site. The composite sample represented the entire runoff event with the individual aliquots representing the portion of flow that occurred during a sampling period. Analysis of data was published in Water and Sewage Works, Vol 122, No 11, November 1975. (See also W76-02695) (Humphreys-ISWS)
W76-02694

BACTERIOLOGICAL QUALITY OF SURFACE RUNOFF FROM AGRICULTURAL LAND, PART II,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
L. L. Harms, P. Middaugh, J. N. Dornbush, and J. R. Andersen.
Water and Sewage Works, Vol 122, No 11, p 71-73, November 1975. 4 fig, 2 tab, 22 ref. EPA R-800400.

Descriptors: *Water pollution sources, *Agricultural runoff, *South Dakota, *Water quality, On-site investigations, Agricultural watersheds, Sampling, Surface runoff, Rainfall, Snowmelt, Bacteria, Coliforms, Streptococcus, Vegetation effects, Oats, Corn(Field), Pastures, Alfalfa, Bromegrass, Soil texture, Loam.
Identifiers: Bacteriological quality, Sandy clay.

Data collected during a recent two-year study of surface runoff from 91 snowmelt and 32 rainfall events from seven sites in eastern South Dakota indicated that runoff from agricultural lands may be a significant source of pollution for surface waters. Total coliform, fecal coliform, and fecal streptococcus determinations were made. In general, the runoff from fields that had minimum cover, such as corn stubble, showed higher total coliform densities. Fields with heavier cover are those with oats stubble, permanent bromegrass and alfalfa, and permanent pasture, and runoff from these fields exhibited low total coliform. Some variations between vegetation covers exist for fecal coliforms, but no distinct separation was apparent. One factor that tends to remove any distinction because of cover would be the common practice of pasturing cattle on most of the fields in the fall. The bacteriological data showed that surface runoff waters from agricultural lands have indicator organism counts that frequently exceed the water quality standards. Addition of these runoff waters to a watercourse can cause degradation and can be construed as pollution. Total coliform densities were usually somewhat greater than fecal streptococcus levels. This relationship would probably be influenced by the coliform organisms that are found in the soil, and it does not necessarily indicate fecal contamination or the presence of pathogenic organisms. (See also W76-02694) (Humphreys-ISWS)
W76-02695

STRATIFIED LAKE AND OCEANIC BRINES: SALT MOVEMENT AND TIME LIMITS OF EXISTENCE,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
D. J. Toth, and A. Lerman.
Limnology and Oceanography, Vol 20, No 5, p 715-728, September 1975. 7 fig, 4 tab, 30 ref. NSF DES 71-0048.

Descriptors: *Salinity, *Saline lakes, *Diffusion, *Stratification, *Brines, Antarctic, Arctic, Lakes, Model studies, Water pollution sources, Path of pollutants.
Identifiers: *Salt diffusion coefficient, *Salt transport, *Great Bitter Lake(Egypt).

Pronounced salt concentration gradients in five antarctic, arctic, and Pacific coastal lakes can be accounted for by diffusional transport of salt out of the deeper saline water layers. The computed values of the mean salt diffusion coefficients, based on the ages of salinity stratification, agree to within an order of magnitude with molecular diffusivities for four out of five lakes. This agreement suggests that no major mixing events occurred in the water column during the late historical stages of the lakes. Upper limit time estimates for the removal of most of the salt from the saline bottom layers range from 5000 to 35,000 years, depending on lake depth. Historical records of deepening of the Great Bitter Lake owing to dissolution of a salt layer on the bottom suggest that dissolution was a diffusion controlled process. For the saline brines in the Red Sea Deeps, an assumption that they are transient structures leads to the following estimates of the time to mixing with Red Sea water: 1000-10,000 years, if mixing takes place by diffusional transport of salt between the heavier and lighter brines, and 10,000-100,000 years, if salt diffuses from the brines upward. The geologically short range of times suggests that the possible recycling of times suggests that the possible recycling of evaporative brines through the deeper ocean could not affect the ocean water salinity for any significant time interval. (Lardner-ISWS)
W76-02696

PARTICLE SIZE DISTRIBUTIONS IN A REGION OF COASTAL UPWELLING ANALYZED BY CHARACTERISTIC VECTORS,
Oregon State Univ., Corvallis. School of Oceanography.
J. C. Kitchen, D. Menzies, H. Pak, and R. V. Zaneveld.
Limnology and Oceanography, Vol 20, No 5, p 775-783, September 1975. 7 fig, 1 tab, 10 ref.

Descriptors: *Particle size, *Chlorophyll, *Oregon, Temperature, Salinity, Phytoplankton, Upwelling, Oceanography, Coasts, Oceans, Ecosystems, Biology, Ecology, Distribution patterns, Ocean circulation, Path of pollutants.
Identifiers: *Particulate carbon, Characteristic vectors, Ekman transport, Ocean ecology.

Particle size distributions (8-105 micrometer diameter), chlorophyll, and particulate carbon were measured off the Oregon coast during July 1973. The particle counts were transformed to volume concentration and then subjected to characteristic vector analysis. Ninety-two per cent of the variance was accounted for by linear combinations of the first two characteristic vectors. Two weighting factors defined the proportions of the two characteristic vectors which will, when added to the mean volume concentration curve, approximate the actual data for each sample. Variations in the first weighting factor corresponded well with variations in total volume. Changes in the second weighting factor indicated which segment of the size range contains the largest proportion of the particulate volume. Comparison with temperature and salinity data indicated that the near surface water with proportionately large volumes of particles less than 20 micrometer was warmer and less saline than the surface waters with large volumes between 20 and 50 micrometer. High correlation with particulate carbon and chlorophyll suggested that in both cases a large proportion of the particles is phytoplankton. (Lee-ISWS)
W76-02697

RAIN SCAVENGING OF SO2 AND SULFATE FROM POWER PLANT PLUMES,
Battelle-Pacific Northwest Labs., Richland, Wash. Atmospheric Sciences Dept.
For primary bibliographic entry see Field 5A.
W76-02712

GROUNDWATER POLLUTION FROM SANITARY LANDFILL LEACHATE, OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W76-02733

THE EFFECT OF INCREASING THE ORGANIC CARBON CONTENT OF SEWATE ON NITROGEN, CARBON, AND BACTERIA REMOVAL AND INFILTRATION IN SOIL COLUMNS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W76-02741

TRANSFORMATIONS IN QUALITY OF RECHARGING EFFLUENT IN THE SANTA CRUZ RIVER,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5E.
W76-02750

ACCUMULATION OF THE IRON GROUP ELEMENTS BY PHYTOPLANKTON, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii.
V. V. Gromov, and E. G. Starodubtsev.
Okeanologiya, 14(6), 1006-1011, Illus, 1974.

Descriptors: *Phytoplankton, *Pacific Ocean, Oceans, *Iron, *Metals, Nickel, Manganese, Cobalt, *Absorption.
Identifiers: Detritus, Platymonas-Viridis, Peru.

Phytoplankton (a culture of Platymonas viridis and a natural community taken from the upwelling area in the Pacific Ocean off Peru) accumulates the elements of the Fe group in the order: Fe > Ni > Mn > Co. The accumulation rates decrease in the same order. The absorbed elements are concentrated mainly in phytoplanktonic detritus.--Copyright 1975, Biological Abstracts, Inc.
W76-02772

FORMATION OF METHYL MERCURY BY BACTERIA,
Georgia Univ., Atlanta. Dept. of Food Science.
For primary bibliographic entry see Field 5A.
W76-02812

EVIDENCE FOR THE PRESENCE OF MUTAGENIC POLLUTANTS IN THE MILLERS RIVER: RESULTS OF A PLANT BIOASSAY SYSTEM,
Massachusetts Univ., Amherst. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-02869

TRITIUM AND DEUTERIUM AS WATER TRACERS IN HYDROLOGIC SYSTEMS,
Massachusetts Univ., Amherst. Water Resources Research Center.
G. L. Stewart, and J. R. Stetson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 408, $4.00 in paper copy, $2.25 in microfiche. Water Resources Research Center Pub No 55, Completion Report FY-76-2, May 1975. 44 p, 19 fig, 3 tab, 25 ref. OWRT A-045-MASS(2). 14-31-0001-4021.

Descriptors: *Tritium, *Tracers, Evaluation, Porous media, *Deuterium, *Path of pollutants, Infiltration, Soils, Clay minerals, Water pollution sources.

A study was conducted to evaluate the suitability of deuterium and tritium as tracers to depict water and pollutant movement in porous media. This involved studying the interaction of these tracers with soil materials and evaluating this interaction in terms of retardation in tracer flow velocity, compared to bulk water flow. Previous work had suggested that tritium and deuterium interact with soils and are removed from tracer solution during flow. The data presented clearly show that a tracing front becomes diluted in tracer during infiltration into oven-dried soil. There appears to be very little difference between the degree of tritium and deuterium interaction. The source of interaction is demonstrated to be primarily hydroxyl associated with the clay minerals. These exchange sites are destroyed by heating soil to 700C. which eliminates tracer loss during infiltration.
W76-02870

DISTRIBUTION OF MERCURY, CADMIUM, LEAD AND THALLIUM IN A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
B. J. Mathis, and N. R. Kevern.
Hydrobiologia, Vol 46, No 2-3, p 207-222, 1975. 6 fig, 3 tab, 20 ref.

Descriptors: *Metals, *Distribution, *Water pollution sources, Lakes, *Mercury, *Cadmium, *Lead, *Michigan, Bottom sediments, Fish, Industrial wastes, Toxins, Aquatic plants, Water, Food chains, Diptera, Daphina, Bass Yellow perch, Buliheads, Sunfishes, Zooplankton, Waterfowl, Atmospheric fallout.
Identifiers: *Thallium, Wintergreen Lake(Mich), Chubsuckers, Coontail, Yellow pond-lily.

Mercury was detected in the bottom sediments of Wintergreen Lake, Michigan, and in decreasing concentrations in largemouth bass, hybrid sunfish, yellow perch, yellow bullhead, and lake chubsuckers. In largemouth bass muscle tissue, mercury was highly correlated with length and weight. Mean mercury concentrations in fish tissue exceeded mean levels in bottom sediments. Apparently fish build up a body mercury level in systems where mercury in some components is undetectable. Cadmium and lead were highly concentrated in bottom sediments and were found in all lake components. Ceratophyllum demersum and Nuphar stems and roots had more cadmium than any fish. Zooplankton (Chaoborus and Daphnia) contained cadmium and lead. Thallium was detected only in sediments. Lake sediments acted as a sink for all four metals. A high degree of correlation was not evident between the other metals and fish weight and length. Migratory waterfowl feces contained high cadmium and lead concentrations which may be a major source of contamination. Fallout from airborne particulate matter may be a secondary source for cadmium and lead, but is the primary pathway by which mercury and thallium enter the lake. (Buchanan-Davidson--Wisconsin).
W76-02898

NONPOINT SOURCE MINERAL WATER QUALITY MODEL,
Tennessee Valley Authority, Knoxville. Hydraulic Data Branch.
R. P. Betson, and W. M. McMaster.
Journal Water Pollution Control Federation, Vol 47, No 10, p 2461-2473, October 1975. 6 tab, 27 ref.

Descriptors: *Model studies, *Water quality, *Mineral water, *Computer models, *Water quality control, *Tennessee Valley Authority, Analytical techniques, Demonstration watersheds, Mathematics, Water, Water analysis, Water chemistry, Chemical analysis, Water pollution control, Water pollution sources, Sulfates, Dissolved solids, Mathematical models, Watersheds(Basins), Mineralogy, Strip mines, Calibrations, Suspended solids, Rating curves.
Identifiers: *Water quality model, *Nonpoint pollution sources, *Mineral quality, *Mineral constituents, *Tennessee Valley, Constituent concentration, Mineral quality simulation, Point pollution sources.

The mineral water quality model can be used at unsampled locations to simulate the concentration and/or transport of constituents under natural conditions by using available map measures alone. It is a first-generation model because it is designed to be calibrated by using existing data. The model has been regionalized by using data collected in the Tennessee Valley, which includes a variety of conditions. The model was tested on 12 watersheds not used in calibration. These test areas included six physiographic provinces. The results obtained indicated that the model usually can simulate well within the range of values typically observed for a constituent. The average absolute simulated error for 24 samples was within + or - 30% for many constituents and was above 60% for only two mineral constituents. The model represents an efficient way to represent water quality information. The essential information for many analyses in a region is contained in 15 pairs of equations that may easily be stored in a computer to provide an automatic natural water quality simulation capability. (Henley-ISWS)
W76-02922

EVALUATION OF THE STRENGTH AND SEAKEEPING ABILITY OF POLLUTION CONTROL BARRIERS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-02929

REPORT ON INVESTIGATION OF WATER QUALITY OF CHRISTMAS LAKE WATERSHED.
Minnesota Pollution Control Agency, Minneapolis. Div. of Water Quality.
Report, January 1975. 55 p, 5 fig, 20 photo, 10 tab, 12 ref.

Descriptors: *Water quality, *Runoff, *Surveys, *Minnesota, *Nutrients, Water pollution sources, Pollutant identification, Water pollution, Path of pollutants, Pollutants, Watersheds(Basins), Lakes, Surface waters, Domestic animals, Farm wastes, Water balance, Septic tanks, Domestic wastes, Streamflow, Drainage, Erosion, On-site investigations.
Identifiers: *Christmas Lake(Minn).

The investigation of Christmas Lake in Carver and Hennepin Counties (Minnesota) was undertaken by the Minnesota Pollution Control Agency as an amicus curiae (friend of the court) to provide technical information of the water quality of Christmas Lake Watershed. The objective of the study was to determine the nutrient sources of Christmas Lake and their relative contributions to the nutrient budget and specific loading of the lake. This report culminated the field investigation and sampling of Christmas Lake and its watershed by personnel of the Division of Water Quality, and covered data collected from April 1973 through April 1974. Characteristics of Christmas Lake described in this report were nutrient sources, hydrologic budget, nutrient budget, specific loading rates and bacteriological water quality of its tributaries. Those characteristics which could not or were not directly measured were estimated on the basis of a literature review of similar research in the same subject area. From the data collected during the survey period, four sources were identified as contributors of nutrients to Christmas Lake Creek: Twin Hills property, Metcalf property, natural runoff, and County Road 17 right-of-way runoff. All water quality data which was collected on Christmas Lake Creek has been compiled and analyzed to determine relative nutrient concentrations within the creek. It was apparent from the data collected that the majority of nutrients are contributed during spring snowmelt and after significant rainstorms. (Sims-ISWS)
W76-02931

LIMESTONE BARRIERS TO NEUTRALIZE ACIDIC STREAMS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5G.
W76-02938

INVESTIGATION OF MATHEMATICAL MODELS FOR THE PHYSICAL FATE PREDICTION OF DREDGED MATERIAL,
Army Engineer Waterwasys Experiment Station, Vicksburg, Miss. Office of Dredged Material Research.
B. H. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-776 368, $4.50 in paper copy, $2.25 in microfiche. Technical Report D-74-1, March 1974. 54 p, 4 fig, 59 ref, 1 append.

Descriptors: *Dredging, *Mathematical models, Spoil banks, Dispersion, Pipelines, Estuarine environment, Wastes, Waste disposal, Sands, Gravels, Aquatic environment, Harbors, Clays, Silts, Disposal, Inland waterways, Diffusion, Tidal effects, *Path of pollutants.
Identifiers: *Dredged materials, Dynamic collapse, Riverine environment, Sensitivity analysis, Disposal site.

A literature search of technical journals coupled with contacts with other research groups revealed that very little mathematical modeling of the physical fate of dredged material disposed of in an aquatic environment had been undertaken. The most significant modeling effort that was found was a mathematical model for prediction of dispersion and settling in barged ocean disposal of wastes developed by R.C.Y. Koh and Y.C. Chang.

This model allowed for disposal of dredged material by instantaneous bottom dump as well as pumping the material through a pipe under a moving barge. In both disposal operations, the material was traced through three possible phases: convective descent, dynamic collapse, and long-term diffusion. The dynamic collapse was also generalized to account for the possibility that the cloud had hit the bottom. As a result of investigations of identified models and relevant transport studies, the following recommendations were offered: (1) in the ocean environment, sensitivity analyses and field verification of the Koh-Chang model are needed; (2) model development in the area of predicting the short-term fate of dredged material in the vicinity of the disposal site is needed for the estuarine environment; and (3) no model development is recommended for the river disposal problem until further investigation of a project by Schroeder at Oregon State University is completed. (Roberts-ISWS)
W76-02946

EFFECTS OF ORGANIC SOLUTES ON CHEMICAL REACTIONS OF ALUMINUM,
Geological Survey, Menlo Park, Calif.
C. J. Lind, and J. D. Hem.
Available from Supt of Documents, GPO, Wash, DC 20402, price $1.35. Water-Supply Paper 1827-G, 1975. 83 p, 42 fig, 13 tab, 82 ref.

Descriptors: *Chemical reactions, *Water chemistry, *Aluminum, *Organic compounds, Solutes, Natural resources, Labortory tests, Analytical techniques, Inorganic compounds, Physical properties, Geology, Chemical properties, Aqueous solutions.

Concentrations of organic matter in the general range of 1-10 milligrams per litre organic carbon are common in natural water, and many naturally occurring organic compounds form aluminum complexes. The aluminum concentrations in near-neutral pH solutions may be 10-100 times higher than the values predicted from solubility data if formation of such organic complexes is ignored. The processes of polymerization of aluminum hydroxide and precipitation of gibbsite are inhibited by the presence of the organic flavone compound quercetin in concentrations as low as 10 to the minus 5.3 mole per litre. In the presence of both dissolved aluminum and aqueous silica, low concentrations of quercetin improved the yield of crystallized kaolinte and halloysite. Small amounts of well-shaped kaolinte and halloysite crystals were identified by electron microscopy in solutions with pH's in the range of 6.5-8.5 after 155 days aging in one experiment and 481 days aging in a repeated experiment. The improved yield of crystalline material obtained in the presence of quercetin probably is the result of the influence of the organic compound on the aluminum hydroxide polymerization process. Natural water containing color imparted by organic material tends to be higher in aluminum than would be predicted by pH, silica concentrations, and solubility data for inorganic aluminum species. (Woodard-USGS)
W76-02953

EVALUATION OF COPPER ACCUMULATION IN PART OF THE CALIFORNIA AQUEDUCT,
Geological Survey, Menlo Park, Calif.
R. H. Fuller, and R. C. Averett.
Water Resources Bulletin, Vol 11, No 5, p 946-952, October 1975. 1 fig, 2 tab, 9 ref.

Descriptors: *Copper sulfate, *Surface waters, *Environmental effects, *Ecosystems, *Water treatment, Phytoplankton, Algae, Data collections, Sampling, Path of pollutants, Water pollution effects, Water quality, Sediments, California.
Identifiers: *California aqueduct, Absorption(Bioaccumulation).

Copper sulfate has been used extensively in the California Aqueduct to control phytoplankton and the algae Cladophora. Since 1969 more than 250,000 pounds of copper sulfate has been added to a part of the aqueduct. Although copper sulfate is effective in controlling algae, copper tends to accumulate in the system in which it is applied. Samples of water, biota including plants, clams, and snails, as well as sediment were analyzed for copper. Results of these analyses showed that copper concentrations in the water, with three exceptions, were less than 10 micrograms per litre. Samples of plant tissue showed a 198 percent increase in copper concentration in the treated reach of the aqueduct, and clam tissue showed a 68 percent increase. Snails in the treated reach had 77 percent more copper than in the untreated reach whereas copper concentrations in the sediment doubled. None of the concentrations found are considered to be harmful to the biota. (Woodard-USGS)
W76-02957

5C. Effects Of Pollution

ZOOPLANKTON PRODUCTION IN LAKE ONTARIO AS INFLUENCED BY ENVIRONMENTAL PERTURBATIONS,
State Univ. of New York at Albany. Dept. of Biological Sciences.
D. C. McNaught, M. Buzzard, and S. Levine.
Available from the National Technical Information Service, Springfield, Va 22161. Envrionmental Protection Agency, Report EPA-660/3-75-021, June 1975. 156 p, 19 fig, 19 tab, 47 ref, 2 append. EPA 1BA026. Grant 800536.

Descriptors: *Zooplankton, *Lake Ontario, Lakes, Great Lakes, *Primary production, Nutrients, *Eutrophication, Model studies.

The Crustacean zooplankton are excellent indicators of environmental perturbation, especially if enough of their biology is known to explain why certain species increase with nutrient enrichment of lakes. The distribution of zooplankton in Lake Ontario suggested that eutrophic indicators were found in the vicinity of major urban centers. The ratio of the number of Bosmina longirostris, the most successful eutrophic species, to Diaptomus sicilis, the most oligotrophic form, supported this conclusion. Furthermore, mathematical indices, including diversity, the community competition coefficient, and carrying capacity, separated urban inshore from rural inshore waters, further evidence of perturbation. Biomass estimates made with new acoustical techniques indicated that most of the zooplankton biomass was in deep waters, thus the eutrophication of Ontario's waters, both nearshore and in the vicinity of cities, is still localized in nature. Mathematical techniques have been developed to model such perturbations. (EPA).
W76-02502

SESTON AND PERIPHYTON OF THE RIVER VISTULA ON THE SECTOR FROM NOWY BIERUN TO THE WATER STAGE AT LACZANY AND ON THE LACZANY: SKAWINA CANAL (IN POLISH),
Polish Academy of Science, Krakow. Zaklad Ochrony Przyrody.
For primary bibliographic entry see Field 5B.
W76-02513

PREDICTING EFFECTS ON FISH OF FIRE RETARDANTS IN STREAMS,
Forest Service (USDA), Ogden. Intermountain Forest and Range Experiment Station.
W. P. Van Meter, and C. E. Hardy.
U.S. Department of Agriculture, Forest Service, Research Paper INT-166, June 1975, 16 p, 7 fig. 11 ref, 1 tab.

Descriptors: *Fish, *Toxins, *Streams, *Water pollution effects, *Water pollution sources, Hazards, Poisons, Lethal limit, Chemicals, Retardants, Pollutants, Water pollution, Toxicity.
Identifiers: *Fire retardants.

A method of estimating the hazard to game fish caused by release of fire-retardant chemicals into streams is described. Field measurements necessary for application of the method are (1) the amount of retardant (pounds of nitrogen, calculated as ammonia) that enters a stream and (2) the discharge rate and average velocity of the stream, both measured at or near the point of retardant introduction. The result is an estimate of the time, or distance, necessary to allow dilution of the pollutant by shear and turbulent mixing to produce nonlethal conditons. (Witt-IPC)
W76-02519

CLEARCUTTING AND BURNING SLASH ALTER QUALITY OF STREAM WATER IN NORTHERN IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W76-02522

EQUILIBRIUM ADSORPTION OF INORGANIC PHOSPHATE BY LAKE SEDIMENTS,
Massachusetts Univ., Amherst.
W. C. Ku.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 75-16,572. PhD Thesis, 1975, 205 p.

Descriptors: *Equilibrium, *Adsorption, *Phosphorus compounds, *Lake sediments, Temperature, Oxidation-reduction potential, Environment, Mathematical models, Isotope studies, Eutrophication, Water pollution, Iron, Aluminum, Hydrogen ion concentration, *Massachusetts.
Identifiers: *Surface sediments, Lake Warner(Mass), Lake Wyola(Mass), Langmuir adsorption equation, Isotopic exchange.

Eutrophication has become a problem of national concern. An understanding of the behavior of phosphorus in different waters is essential to insure control of eutrophication. A study was undertaken on Lake Warner and Lake Wyola, both in Massachusetts, on the adsorption of inorganic phosphates in surface sediments. The pH, temperature, and redox potential were studied. An isotopic exchange method, using P32, was used to determine the phosphorus attached to the surface of the sediment, and to determine the adsorption maxima. For the two lakes studied, the Langmuir adsorption equation accurately described the phosphate adsorption data. Adsorption capacities for the sediments increased as pH and temperature decreased but as redox potential increased. Iron and aluminum were important in the fixation of phosphate in lake sediments, the relative importance depending on the type of sediment and the environmental conditions prevailing in the sediment. It was found that changes in redox potential caused changes in the amount of iron released from the sediment but had no effect on the aluminum. Redox potential can be used as an important parameter for sediment phosphate adsorption studies. The data derived from these studies can be used for mathematical models for the prediction of the phosphate exchange processes between lake sediment and the overlying waters. (Pinto-FIRL)
W76-02562

A SIMULATION MODEL FOR STUDYING EFFECTS OF POLLUTION AND FRESHWATER INFLOW ON SECONDARY PRODUCTIVITY IN A ECOSYSTEM,
North Carolina State Univ., Raleigh.
R. W. Johnson.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No 75-17,101. Ph.D. Thesis, 1975, 121 p.

Descriptors: *Model studies, *Water pollution effects, Environmental effects, Water management(Applied), Water resources development, Estuarine fisheries, Estuarine environment, Texas, Data collection, Simulation analysis, Model studies, Water pollution control, Shrimp, Fish migration, Fish management.

A simulation model was developed to evaluate the ecosystem of Galveston Bay, Texas. The effects of humans on secondary productivity (harvestable species such as fish and shellfish) is defined in terms of factors such as quantity and quality of inlet fresh water and pollutants. Information was derived from existing physical parameters model and from pertinent biological measurements. The purpose of this model is to provide predictive information for the management of estuaries. The results were particularly useful to pollution control and fisheries management in systems having migrating species of fish, shrimp, and crabs. The Galveston Bay, Texas, area was found to be a highly productive temperate-zone ecosystem, subject to human related stresses. An objective of this study was to identify which biological, chemical, and physical parameters should be measured for the development of models of similar ecosystems. (Kramer-FIRL)
W76-02567

DIURNAL OSCILLATIONS OF OXYGEN CONCENTRATION IN THE PHOTOSYNTHETIC LAYER AND PRIMARY PRODUCTION COMPUTATION, (IN RUSSIAN),
V. B. Tseitlin.
Okeanologiya, Vol 14, No 6, p 1087-1091, 1974. Illus. (Engl. summ.).

Descriptors: *Phytoplankton, Plankton, Measurement, *Diurnal distribution, *Oceans, *Photosynthesis, *Primary productivity, Dissolved oxygen.

An estimate is obtained of the diurnal oscillations of dissolved oxygen concentration in the photic layer. The existing accuracy of measurements does not permit this value to be used for computing (phytoplankton) primary production in the ocean.--Copyright 1975, Biological Abstracts, Inc.
W76-02588

CHARACTERISTICS OF THE RADIATION CONDITIONS OF DEVELOPMENT OF EGGS OF FRESHWATER FISHES BELONGING TO DIFFEENT ECOLOGICAL GROUPS, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
G. B. Pitkyanen, and Yu. A. Zaitsev.
Ekologiya. 5(6): 73-75. 1974.

Descriptors: Fish, Freshwater fish, *Pike, *Perch, *Irradiation, Radioisotopes, *Cesium, *Strontium radioisotopes, *Fish eggs.
Identifiers: Cesium-137, *Eggs, Esox-Lucius, Perca-Fluviatilis, Strontium-90.

An evaluation is given of doses created by isotopes Sr90 and Cs137 in the eggs of fishes (pike, Esox lucius; perch, Perca fluviatilis) developing under natural conditions. The dose from the following irradiation sources was estimated: isotopes accumulated by the egg content; isotopes preferentially sorbed by the egg membrane; isotopes dissolved in water; and isotopes sorbed by the bottom deposits. When predicting the effect of ionizing radiation on developing eggs it is necessary to take into account the ecological conditions of the developing eggs and to calculate the doses received by them before oviposition.--Copyright 1975, Biological Abstracts, Inc.
W76-02615

A LAKE--HOW DOES IT BEHAVE,
Texas Univ. at Austin. Dept. of Civil Engineering.
G. A. Rohlich.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 31-39.

Descriptors: *Control, *Lakes, *Eutrophication, Lake stages, Economic impact, Effluents, Zoning, Urban runoff, Sewage treatment, Nutrient removal, Wisconsin.

The definition of a lake as a body of water surrounded by land is too restrictive, since the entire lake basin influences the character and behavior of the lake. The importance of stratification, benthos, and eutrophication are discussed. Unpolluted waters have a wide variety of species and a dynamic biological balance. Under eutrophic conditions, there are comparatively few species which dominate with the consequent absence of biological balance. Domestic and industrial waste waters are sources of organic materials and energy. The trophic nature of a lake is influenced by climatic conditions, topography, conformation, wind patterns, geology, erosion, and human influences. Techniques for measuring eutrophication are discussed. Eutrophication affects water quality, water supplies, recreational uses, and agricultural uses. Approaches which have been taken to solve eutrophication problems are mentioned, e.g., diversion of effluents around a lake (as in Lakes Mendota and Kegonsa, Madison, Wisconsin; Lake Tahoe, Nevada-California; and Lake Washington, Washington); urban drainage; removal of weed debris and rough fish; dredging of lake sediments; withdrawal of hypolimnetic water; watershed zoning; and control of nuisance plant growth. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02644

ALTERNATIVES TO PROTECT AND ENHANCE LAKES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-02648

THE FACTS OF LIFE,
Wisconsin Univ. Center System-Marinette County, Bay Shore. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-02651

HIGHWAY AND SEWER IMPACTS ON URBAN DEVELOPMENT,
Environmental Impact Center, Inc., Newton, Mass.
F. T. Rabe, and J. F. Hudson.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol 101, No UP2, p 217-231, November 1975. 4 fig, 4 tab, 5 equ, 25 ref.

Descriptors: *Planning, *Sewers, *Highways, *Statistical methods, *Investment, Land use, Waste water(Pollution), Public utilities, Employment, Estimating, Regression analysis, Mathematical models, Equations, Systems analysis, Construction.
Identifiers: *Environmental impact statements, *Urban development, Housing, Residential.

Public investments in highways and sewerage facilities have an important influence on the form, location, and timing of urban development. However, the magnitude and variability of this influence remains uncertain. Statistical analyses of historical highway and sewer investments in four U.S. metropolitan areas suggest that the role of these public investments in bringing about new urban growth depends upon local land market conditions, as well as existing levels of wastewater and transportation service. Simple models were estimated that relate the amount of residential, commercial, and industrial development to the availability of vacant land, sewer service, proximity to highways, and residential vacancy rates. These models provide a preliminary analytical basis for projecting the likely effects of proposed highway and sewer projects on local urban development.
W76-02717

SIGNIFICANCE OF VITAMINE B12 IN MARINE BIOCENOSES, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
For primary bibliographic entry see Field 5A.
W76-02719

EFFECTS OF SURFACE CONFIGURATION IN WATER POLLUTION CONTROL ON SEMIARID SURFACE MINED LANDS,
Montana State Univ., Bozeman. Dept. of Animal and Range Sciences.
For primary bibliographic entry see Field 5G.
W76-02726

SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: RESEARCH RESULTS,
Environmental Impact Center, Inc., Newton, Mass.
S. E. Bascom, K. G. Cooper, M. P. Howell, A. C. Makrides, and F. T. Rabe.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-600/5-75-013, July 1975. 209 p, 19 fig, 28 tab, 27 ref, 3 append. 1HA095 21 ART 11, EQC 317.

Descriptors: Analytical techniques, Regional development, Community development, Land use, Water resources, Planning, Data collections, Storage and retrieval, Environment, Highways effects, *Investments, *Waste water treatment, *Transportation.

This report is the second of a two-part research study. The first report involved an extensive review of previous research pertaining to secondary effects of highways, mass transit, wastewater treatment and collection systems, and of land use models which might be utilized to preject secondary environmental effects. The report is published under the title: 'Secondary Impacts of Transportation and Wastewater Investments: Review and Bibliography', (EPA No. 600/5-75-002, January, 1975). The second report (this publication), presents the results of original research on the extent to which secondary development can be attributed to highways and wastewater treatment and collection systems, and what conditions under which causal relations appear to exist. Case studies of recent development trends were made in four metropolitan regions: Boston, Massachusetts; Denver, Colorado; Washington, D.C.; and Minneapolis-St. Paul, Minnesota. Data for the four metropolitan regions were analyzed using econometric techniques and simulation modeling. The data tape (TMP 243) is stored with Optimum Systems Incorporated, Washington, D.C. This report consists of four sections: an Introduction and Summary of Findings; a technical documentation of case studies and econometric analysis; an evaluation of the Findings and Suggestions for Further Research; and Appendices summarizing the dynamic model and its application. (EPA)
W76-02757

LAKE CLASSIFICATION--A TROPHIC CHARACTERIZATION OF WISCONSIN LAKES,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 2H.
W76-02764

SURVIVAL OF PATHOGENS IN ANIMAL MANURE DISPOSAL,
Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.
S. L. Diesch, P. R. Goodrich, B. S. Pomeroy, and L. A. Will.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 005, $6.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-012, June 1975. 129 p, 16 fig, 60 tab, 44 ref, append. EPA 1BB039. R 802205.

Descriptors: *Oxidation lagoons, Dispersion, Aerosols, *Public health, *Farm wastes, Salmonella, Cattle, Environmental sanitation, *Waste treatment, Seasonal.
Identifiers: Pathogens, Pasveer ditch, Zoonoses, Leptospira, Leptopirosis.

A research project was conducted to measure and evaluate the public health effects of pathogens in beef cattle manure found in the extended aeration system of waste disposal. Model oxidation ditches were used in laboratory studies. At simulated summer and winter environmental conditions, determinations were made of the viability and infectivity of leptospires in weanling hamsters and salmonella in turkey poults. Salmonella was transmitted by aerosols, but leptospires were not. In refeeding contaminated slurry contents salmonella was transmitted but leptoshpires not. Leptospires isolated from the slurry of the model ditch 17 days post seeding had lost measurable virulence. Measurements of selected microbial aerosols were made in the vicinity of a field ditch. Bacterial levels of 100-200 total colony-forming units per liter of air were associated with the beef cattle population in the housing unit and not with aerosols generated by the oxidation ditch treatment system. Studies were made on a model oxidation dithc simulating the field ditch. The winter temperature conditions (2-5 dec C) slowed the degradation process considerably and high dissolved oxygen was maintained. (EPA)
W76-02765

PRINCIPAL TENDENCIES IN THE BIOLOGY OF THE MODERN BALTIC SEA, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.
I. I. Nikolaev.
Okeanologiya, 14(6), 1059-1069, Illus, 1974.

Descriptors: *Oceans, *Eutrophication, *Wildlife, Aquatic wildlife, Agricultural wastes, *Water pollgtion, Growth rates, Populations.
Identifiers: *Baltic Sea, Invertebrate, USSR.

During the last 50-60 yr the following tendencies have become apparent in the biology of the Baltic Sea: enrichment of the fauna (e.g., invertebrates, fish) and flora through the penetration of saltwater species from the North Sea and Scandinavian straits; enrichment of the fauna of warm-water species also from the west (this tendency was pronounced from 1920-1930); enrichment of the fauna due to a spontaneous anthropogenic dispersal of the marine and saltwater species of different marine basins; and anthropogenic eutrophication of the sea. The tendency has been most pronounced during the last 10-15 yr. It reflects the growing pollution of the sea by organic matter and inorganic biogenic matter, in particular from the cultivated agricultural areas within the Baltic Sea basin.--Copyright 1975, Biological Abstracts, Inc.
W76-02770

ACCUMULATION OF THE IRON GROUP ELEMENTS BY PHYTOPLANKTON, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Fizicheskoi Khimii.
For primary bibliographic entry see Field 5B.
W76-02772

TOXICITY OF COPPER COMPLEXES TO FRESHWATER MOLLUSKS,
V. T. Kapkov.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-763 967, $3.50 in paper copy, $2.25 in microfiche. Typescript, 5 p, 1 fig, 1 tab. Trans from Pochvovedenie, Vol 26, No 2, 1971.

Descriptors: *Heavy metals, Copper, Copper compounds, *Toxicity, *Mollusks, Water pollution, Environmental effects, Animal pathology, Adsorption, Bioassay, Toxins, Spectrophotometry, Water pollution effects, Lethal limit.
Identifiers: Pyridine, *Pyridine homologues, *Copper complexes, *Moscow River, Freshwater mollusks, Gills, Bivalve mollusks, Gastropod mollusks.

Information is presented on the toxicity, for fresh water mollusks, of copper complexes with pyridine, alpha-, beta-picoline, and 2,6-lutidine in concentrations of 0.01 to 5.0 mg of copper liter. This information was compared with the toxicity of pyridine and its homologues alone and with the toxicity of copper ions along. Mollusks caught in the Moscow River were kept in 10 liter aquariums to which the test substances were added in solution. The pH, temperature, and water contents were kept constant. Solutions were changed in experimental and control aquariums after 48 hours. Alpha-picoline-copper and 2,6-lutidine of copper exerted a less toxic effect than cupric chloride, while dichloropyridine copper and a complex of copper with beta-picoline were more toxic. Toxicity was measured by death of the mollusks for periods up to 30 days. Pyridine and its homologues did not exert a toxic effect. Most copper absorption took place in the first 6 hours of the experiment. Active excretion of the copper from the mollusk occurred. The copper concentration was greatest in the gills, as determined spectrophotometrically. (Davis-Vanderbilt)
W76-02780

DYNAMICS OF HAZARDOUS ELEMENTS IN WASTEWATER PONDS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5D.
W76-02867

EVIDENCE FOR THE PRESENCE OF MUTAGENIC POLLUTANTS IN THE MILLERS RIVER: RESULTS OF A PLANT BIOASSAY SYSTEM,
Massachusetts Univ., Amherst. Dept. of Botany.
E. J. Klekowski, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 406, $4.50 in paper copy, $2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publ No 56, Completion Report FY-76-3, September 1975, 54 p. OWRT A-063-MASS(1). 14-31-0001-5021.

Descriptors: Pollutants, *Massachusetts, Industrial wastes, *Bioassay, *Cytological studies, *Chromosomes, Water pollution effects, Water pollution sources.
Identifiers: *Mutagenic pollutants, Millers River(Mass), Osmunda regalis, Royal fems, Heterozygous, Meiotic samples, Mutations.

A population of royal ferns, Osmunda regalis, which is periodically submersed by the waters of the Millers River was found to have a very high frequency of chromosome mutations. The Millers River is located in western Massachusetts and is heavily polluted with industrial wastes. Approximately 43% of meiotic samples collected in 1973 from the Millers River population were heterozygous for mutations such as paracentric inversions of reciprocal translocations whereas less than 1% of meiotic samples from nearby non-polluted control populations were such heterozygotes. Cytological analysis within royal fern clones indicate that practically all of the chromosome mutations were post-zygotically induced and that at least 64% were induced since 1969. In the course of this study over 26,000 spore mother cells were analyzed for chromosome aberrations. In addition, further studies were carried out screening sporophyte populations for detection of mutations. The level of mutational damage in the river population approximated that previously documented from the chromosome study, whereas control populations did not indicate any mutational damage to the sporophyte.
W76-02869

GEOCHEMICAL IMPACT ON LEAD-MINING WASTEWATERS ON STREAMS IN SOUTHEASTERN MISSOURI,
Missouri Univ., Rolla.
E. Bolter, J. C. Jennett, and B. G. Wixson.
Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayett, Indiana, Engineering Extension Series No 141, Part 2, p 679-686. 6 fig, 5 tab, 5 ref.

Descriptors: *Waste water treatment, *Heavy metals, *Mine water *Lagoons, Mining, *Lead, *Missouri, Streams, Water pollution effects, Copper, Zinc, Manganese.
Identifiers: Retention ponds.

Southeastern Missouri is now the site of the largest lead producing district in the world. Investigative results show how the mining activity affects the area's surface waters, and treatment methods of mine waters are described. During the first few years of mining, the heavy metal content of the streams rarely exceeded 20 microgram/1. However, below the point of the confluence of streams and the milling waste waters of several mines, a pronounced growth of bacterialagal slime was observed on the bottom of streams, probably stimulated by organic reagents in the milling water. Algal samples contained large amounts of rock flower, an indication that the algal mats act as a 'filter' for metal-rich rock flower from the tailing retention ponds. The small heavy metal content observed in the effluents of mine and mill water retention ponds indicated the high efficiency of the ponds in reducing this compound, thus permitting the lagoon effluents to be discharged into streams; excess heavy metals are probably precipitated as carbonates. Because of the minimal heavy metal content of the mine water in the effluents, it is recommended that mine and mill water effluents be separated and the latter recycled in order to eliminate algal slime in streams. (Auen-Wisconsin)
W76-02897

DISTRIBUTION OF MERCURY, CADMIUM, LEAD AND THALLIUM IN A EUTROPHIC LAKE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W76-02898

BAYTEX EFFECT ON SOME REPRESENTATIVES OF THE KARELIAM ASSR HYDROFAUNA, (IN RUSSIAN),
Akademiya Nauk SSSR, Petrozavodsk. Karelskii Filial.
Z. I. Filimonova.
Gidrobiol Zh. 53-60 Illus. 1974.

Descriptors: *Insecticides, *Mortality, *Water pollution effects, Crustaceans, *Copepods, *Daphmia.
Identifiers: Acanthocyclops-Sp, *Baytex effect, *Daphnia-Pulex, Karelian-ASSR, Methyl-0-4-Methylthio-M-Tolyl, O, Phosphorothioate, *USSR.

The effect of different concentrations (0.00001-2%) of emulsified Baytex (0,0-dimethyl 0-(4-methylthio)-m-tolyl) phosphorothioate) on representatives of Copepoda and Cladocera from the forest puddles in Karelia (Russian SFSR, USSR) was studied. For Copepoda (Mainly Acanthocyclops ssp.) concentrations of 0.1-2% were toxic; the numbers of Copepoda were reduced by 24 h after the water bodies treatment. For Cladocera (Daphnia pulex); almost all the experimental concentrations were lethal; death of Cladocera (100%) came within 2-3h. The minimum tested concentration of the insecticide was toxic for Cladocera; about 60% of the Cladocera died 24 h after the treatment. The efficiency of the preparation increased wiht the water temperature elevation.--Copyright 1975, Biological Abstracts, Inc.
W76-02899

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE REAERATION OF UNIFORM STREAMS,
Mississippi Univ., University. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-02934

CHANGE OF SOME PHYSIOLOGICAL AND BIOCHEMICAL INDICES OF PHRAGMITES COMMUNIS TRIN. WITH DIFFERENT MINERAL NUTRITION UNDER EXPERIMENTAL CONDITIONS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. I. Merezhko, K. B. Yakubovskii, and P. N. Shiyan.
Gidrobiol Zh, 10(3) 90-93, 1974.

Descriptors: *Nutrients, *Chlorophyll, Photosynthesis, Waste water treatments.
Identifiers: Biochemical conditions, Chlorophyll-b, Indices, *Mineral nutrition, *Phragmites-Communis, Physiological conditions, *Reeds.

The exclusion of N, P and K from the nutrient medium led to a decrease in chlorophyll a content in the common reed, P. communis. A decrease in chlorophyll b content occurred only on excluding N from the mixture. The photosynthetic intensity of the reed decreased with complete elimination of only K or N from the medium. The exclusion of N from the medium markedly (5-fold) reduced the reed phytomass increment. This indicates the possibility of using the reed for treating wastewaters rich in N compounds.--Copyright 1975, Biological Abstracts, Inc.
W76-02942

MACROFAUNA OF THE STONY BOTTOM OF LAKE GENEVA, (IN FRENCH),
C. Lang.
Schweiz Z Hydrol. 36(2): 301-350. Illus. 1974. (Engl. and Ger. summ.).

Descriptors: Lakes, *Eutrophication, *Benthic fauna, Lake beds, *Distribution patterns.
Identifiers: Erpobdella-Octoculata, Glossiphonia-Complanata, Helobdella-Stagnalis, *Lake Geneva, *Switzerland.

In Lake Geneva (Switzerland), the macrofauna of the story lake bottom was studied in 7 stations from 1969-1971. The modifications in animal communities since the beginning of the century can be attributed partly to the increasing eutrophication of the lake and partly to the introduction of new species. The stations are classified according to the structure of their animal communities, which allow the degree of eutrophication of each station to be deduced. The analysis of factors which influence the animals' microdistribution on lake-bottom stones reveals many complicated interactions. As a result of this complexity, further research projects were concentrated on leeches (Hirudinea) which colonize artificial substrates in imitation of the underface of stones. Helobdella stagnalis, Erpobdella octoculata and Glossiphonia complanata form the major part of collected fauna. Density fluctuations, population structures (age groups) and quantitative relations between these 3 spp. as well as their vertical and horizontal distribution patterns were examined in detail.--Copyright 1975, Biological Abstracts, Inc.
W76-02985

THE PELAGIC ROTATORIA OF THE SEMPACHERSEE WITH SPECIAL REGARD TO THE BRACHIONIDAE AND THE QUESTION OF NUTRITION, (IN GERMAN),
C. Zimmermann.
Schweiz Z Hydrol. 36(2): 205-300. Illus. 1974. (Fr. and Engl. Summ.).

Descriptors: Lakes, *Mesotrophy, *Rotifers, *Algae, *Reproduction, Chrysophyta, Nannoplankton, Nutrients, Eutrophication.
Identifiers: Brachionidae, Cryptophyceae, Erkenia-Subaequiciliata, Kellicottia-Longispina, Keratella-Chochlearis, Keratella-Quadrata, Sempachersee, *Switzerland(Lake Sempach).

The pelagic rotifers of mesotrophic Lake Sempach (Switzerland) were investigated qualitatively and quantitatively from 1969-71. The rotifer reproduction rate was highest from spring until early summer, with peaks of 0.86 million individuals below 1 dm2 in 1969 and 0.92 in 1970. During summer stratification, production was comparatively low. During both years Keratella cochlearis made up an average of 50% of the total number of rotifers. K. cochlearis, K. quadrata and Kellicottia longispina reproductive rates were calculated, using the egg ratio method of Edmondson. The highest yearly rates of the 3 spp. were noted in spring at a depth of 0-5 m. From spring until early summer in 1970, 88% of the biomass of the 1st large phytoplankton peak were nannoplankton, 70% of which consisted of Cryptophyceae and Chrysophyceae from the end of April until the middle of June. During the investigation of the 3 Brachionidae, inquiries into the food relation to nannoplankton algae showed close relations to these algae groups and more over to micro-algae. In spring the Chrysophyceae Erkenia subaequiciliata seems to be the most important food for the 3 rotifer species.--Copyright 1975, Biological Abstracts, Inc.
W76-02993

5D. Waste Treatment Processes

EFFECT OF GEOGRAPHICAL VARIATION ON PERFORMANCE OF RECIRCULATING COOLING PONDS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5B.
W76-02501

OPTIMIZING A PETROCHEMICAL WASTE BIO-OXIDATION SYSTEM THROUGH AUTOMATION,
Dow Chemical Col, Freeport, Tex. Texas Div.
M. A. Zeitoun, and N. J. Biscan.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-660/2-75-021, June 1975. 200 p, 62 fig, 18 tab, 61 ref, 4 append. EPA 1 BB 036. Grant No S 800 766.

Descriptors: *Waste water treatment, Pilot plants, Industrial wastes, Nutrients, Waste treatment, Treatment facilities, *Automation, *Activated sludge, Control systems, Recycling, Sludge treatment, Oxidation, Monitoring, Oil wastes, Organic wastes.
Identifiers: Biological Activity.

Systems were developed to control the critical parameters of the activated sludge process to achieve reliable, high quality effluent. An automated sampling system, sampling feed and homogenized mixed liquor, monitored the total carbon in both samples. Nutrients were added in propartion to the total carbon in the feed, thus maintaining low residual nutrients in the effluent. The sludge recycle flow rate was controlled by a food to microorganisms signal, measured as the ratio of total carbon in the feed to that in the mixed liquor. Toxic or inhibitory effects of the feed were measured by a Biological Inhibitor Detector, an instrument which measures the oxygen uptake of standard solutions before and after exposure of a bacteria sample to a feed sample and calculates an activity ratio. The use of the instrument as an upstream sensing device was demonstrated as toxic substances were added to the feed. The developed on-line control systems are applicable to municipal, industrial or combined treatment plants. (EPA)
W76-02503

PURIFICATION OF STRONGLY POLLUTED EFFLUENTS OF THE PULP INDUSTRY BY RANEY CATALYSTS (PRECHISTVANE NA SILNO ZAM'RSENI OTPAD'CHNI VODI OT TSELULOZNATA PROMISHLENOST CHREZ RANEI-KATALIZATORI),
Kh. Popov.
Trudove na Nauchno-Izsledovatelskiya Institut po Vodosnabdyavane Kanalizatsiya i Sanitarna Tekhinka, Vol 8, No 2, p 135-154, 1973. 1 fig, 27 ref, 2 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Sulfur compounds, Sulfides, Degradation(Decomposition), Cobalt, Nickel, Iron, Catalysts, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Water quality control, Water purification.
Identifiers: *Raney catalysts, Polysulfides, Methyl mercaptan, Dimethyl sulfide, Dimethyl disulfide, Bulgaria.

Results are described on experiments conducted with effluents from the Bulgarian Kiradzhiev kraft pulp mill containing up to 93.5 g/cu m sulfides and polysulfides, up to 779.7 g/cu m methyl mercaptan, up to 249.1 g/cu m dimethyl sulfide, and up to 207.1 g/cu m dimethyl disulfide. These sulfur compounds were degraded, using Raney nickel, Raney cobalt, and Raney iron as catalysts. At a contact time of 1 hr, a temperature of 33-66C, and a catalyst dose of 125-250 g/cu m, the removal of the different compounds ranged from 97% to over 98%. Raney iron gave a somewhat lower degree of purification than the two other catalysts, but its activity was enhanced more by higher temperature and higher dose. Because it is cheaper and more readily available, Raney iron is recommended for the technological process which was developed on the basis of laboratory results. The process is described and illustrated by a diagram. The catalyst can be reused 2-3 times, although its activity is reduced. For regeneration of the catalyst, the sludge containing it is burned, and the metal oxides formed are reduced, the metals being reused for alloying. The preparation of the Raney catalysts is described, and their reactions with the sulfur compounds are discussed. (Stapinski-IPC)
W76-02508

METABOLISM OF SINGLE-CARBON COMPOUNDS IN THE BIOLOGICAL PURIFICATION OF WASTE WATERS (METABOLIZM ODNOUGLERODNYKH SOEDINENII V PROTSESSE BIOLOGICHESKOI OCHISTKI STOCHNYKH VOD),
Voronezh State Univ., (USSR).
E. N. Makeeva, A. N. Makeev, and I. D. Rodziller.
Prikladnaya Biokhimiya i Mikrobiologiya, Vol 11, No 3, p 367-373, May/June, 1975. 1 fig, 14 ref, 3 tab. English summary.

Descriptors: *Biological treatment, *Waste water treatment, *Organic compounds, *Metabolism, *Activated sludge, *Microorganisms, Aeration, Oxidation, Carbon dioxide, Water pollution sources, Carbon radioisotopes, Isotope studies, Chemical wastes, Alcohols, Organic acids.
Identifiers: Formaldehyde, Methanol (Methyl alcohol), Formic acid, Serine.

The machanism and kinetics of metabolism of carbon-14 labeled formaldehyde, methanol, and formic acid by activated sludge microorganisms (which had been adapted to growing on substrates containing these compounds) were studied in model aeration equipment of 8-liter capacity. Individual compounds and their binary and ternary mixtures were used as substrates for the activated sludge. According to data obtained, formaldehyde is metabolized in preference to the two other compounds. It is oxidized to carbon dioxide via formate and incorporated directly through primary synthesis of serine. This reaction is intensified in the presence of methanol. Oxidation of methanol to carbon dioxide is inhibited in the presence of formaldehyde or formate, while the rate of oxidation of formate is not affected by the presence of the two other compounds. (Stapinski-IPC)
W76-02514

BIOMASS -- A PRODUCT OF BIOLOGICAL PURIFICATION OF PULPING EFFLUENTS AS FEED FOR POULTRY (BIOMASA -- PRODUKT BIOLOGICKEHO CISTENI ODPADNICH VOD PO VYROBE CELULOZY -- JAKO KRMIVO PRO DRUBEZ),
Research Inst. of Veterinary Medicine, Brno (Czechoslovakia).
For primary bibliographic entry see Field 5E.
W76-02515

EFFLUENT CONTROL PLUS WATER AND FIBER RECOVERY.
Processing, vol 21, No 8, p 15, August, 1975. 1 fig.

Descriptors: *Waste water treatment, *Pulp wastes, Wates, Industrial wastes, Water pollution sources, Water pollution treatment, Suspended solids, Water reuse, Flocculation, Water consumption(Except consumptive use), Water conservation.
Identifiers: Tissue mills, Fiber recovery, England.

The effluent treatment plant at Bowater-Scott Corporation's tissue mill at Northfleet, Kent (England) is divided into two self-contained treatment systems: 'clean' and 'dirty'. The water/fiber mixtures from the 3 paper machines are segregated from all other forms of discharge and treated in the 'clean' system when the long fibers are removed by screening and the remaining solids removed by flocculation. This water is reused in the paper mill. Effluent from the floor drains is treated in the 'dirty' system by flocculation to remove suspended solids and discharged. This treatment system has reduced the solids content of the discharge effluent and the consumption of fresh water, and recovered valuable fiber. (Witt-IPC)
W76-02517

UTILIZATION OF ALUMIZED RED MUD SOLIDS (ARMS) FOR PHOSPHORUS REMOVAL,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
E. E. Shannon, and K. I. Verghese.
Canadian Environmental Protection Service, Technology Development Report EPS 4-WP-75-2, 23 p, August, 1975. 3 fig, 4 ref, 4 tab.

Descriptors: *Phosphorus compounds, *Waste water treatment, *Chemical precipitation, Coagulation, Waste treatment, Water pollution treatment, Water pollution sources, Separation techniques, Pilot plants, Municipal wastes, Biochemical oxygen demand, Suspended solids, Aluminum, Sulfates, Heavy metals, Sludge, Operating costs, Costs, Chemicals.
Identifiers: Aluminum compounds, Coagulants.

A new material with coagulant properties is produced by treating the waste product (red mud) from the Bayer aluminum manufacturing process with sulfuric acid and crushing the resulting dried product to a fine powder. The material has physical characteristics similar to pulverized lime and is referred to as alumized red mud solids (ARMS). ARMS has potential application in waste water treatment systems, particularly for phosphorus removal. Pilot plant experiments utilizing ARMS to treat a municipal waste water are described. BOD, suspended solids, and total phosphorus removal efficiencies obtained at an ARMS dosage of 200 mg/liter were comparable to removals obtained at common dosage levels of alum (aluminum sulfate), a traditional phosphorus precipitant. Heavy metal impurities in the ARMS accumulated in the primary sludge; this could be a problem if sludge disposal on land is selected as a disposal alternative. ARMS can be used in full scale phosphorus removal systems, resulting in chemical operating costs as much as 50% lower than comparable alum systems. (Witt-IPC)
W76-02520

HARDNESS REMOVAL BY ION EXCHANGE WITH A RECOVERABLE ORGANIC REGENERANT,
Purdue Univ., Lafayette, Ind.
G. V. Johnson.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No 75-17,217. PhD Thesis, 1974, 247 p.

Descriptors: *Ion exchange, *Effluents, *Waste water treatment, *Recycling, Sodium, Calcium compounds, Magnesium compounds, Hardness(Water), Organic compounds, Membrane processes, Water reuse.
Identifiers: *Glucosamines, Regenerants, Ultrafiltration.

Currently sodium cycle ion exchange regenerant effluents are discharged, without treatment, directly to sewer systems or natural waterways. Because these effluents contain excessive concentrations of dissolved solids, particularly calcium and magnesium, it is expected that such discharge will soon be prohibited under the Federal Water Pollution Control Act. Alternative disposal methods or removal of hardness-causing ions were investigated, particularly the possibility of a water softening process involving regenerant reuse. The treatment system consisted of removing hardness-causing ions by ion exchange, using glucosamine as a recoverable organic regenerant, and subsequently concentrating the eluted glucosamine for reuse by means of an ultrafiltration membrane system. Calcium and magnesium were exchanged on a cation exchange resin in a glucosamine cycle, and an effluent with a glucosamine concentration of 3000-3500 mg/liter, initial breakthrough volume of 2000 ml, and initial specific treatment capacity of 650 gal/cu ft of resin was produced. A confirmation process for cyclic reuse of the glucosamine regenerant was performed, with the use of a membrane recovered glucosamine concentrate to regenerate the ion exchange column. A net result of achieving the same degree of regeneration previously attained with the unused glucosamine was found. (Kramer-FIRL)
W76-02561

WATER QUALITY MANAGEMENT PLANNING FOR THE ROARING FORK RIVER BASIN IN WESTERN COLORADO,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5G.
W76-02563

GROWTH KINETICS OF HETEROGENEOUS MICROBIAL POPULATIONS AND THE MODELLING OF BIOLOGICAL WASTE TREATMENT REACTORS,
Toronto Univ. (Ontario).
C. P. Michellepis.
Available from National Library of Canada, Ottawa. Ph.D. Thesis, 1973.

Descriptors: *Activated sludge, *Mathematical models, Temperature, Microorganisms, Growth rates, Kinetics, Biomass, Biological treatment, *Waste water treatment, Monitoring.
Identifiers: Fujimoto equation, Food to microorganism ratio, Solids retention time, Bench-scale studies.

A study was performed to ascertain whether, at constant temperature, the growth parameters of heterogenous populations in the activated sludge process are determined solely by the composition of the waste or whether they are also a function of solids retention time (SRT). Mathematical models assume that these parameters are true constants. Bench-scale activated sludge units were operated, of the continuous-flow, completely-mixed type. Various rates of dilution, recirculation and cell wastage were compared, with and without cell recycle. During these growth studies, the increase in biomass, carbon uptake, and oxygen uptake were monitored. Results showed rapid 'initial' uptakes of organic carbon and increases in optical density which had no apparent effect on oxygen uptake. The apparent biomass yield was found to be a function of solids retention time, but the 'true' biomass yield coefficient was independent of SRT. Data were well correlated by a relationship between specific growth rate and the food:microorganism ratio proposed by Fujimoto. The maximum specific growth rate was strongly correlated with the net specific growth rate of the continuous flow cultures. It was concluded that the growth parameters of heterogeneous populations which operate under one set of conditions should not be used for the prediction of process performance under different operating conditions. A mathematical model for a completely-mixed biological reactor was developed, based on the growth equation of Fujimoto. In batch studies, there was a reasonable agreement between the expected and observed biomass concentrations and observed substrate concentrations were lower than predicted ones. (Kramer-FIRL)
W76-02566

AQUEOUS COMPLEXATION OF COPPER WITH SEWAGE AND NATURALLY OCCURRING ORGANICS,
Michigan Univ., Ann Arbor.
B. R. Culp.
Available from University Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 75-20,324. Ph.D. Thesis, 1975, 128 p.

Descriptors: *Heavy metals, *Pollution identification, *Copper, *Analytical techniques, *Sewage effluents, Toxicity, Environmental effects, Municipal wastes, Industrial wastes, Treatment facilities, Chromatography, Molecular structure, Chemical oxygen demand.
Identifiers: Gel chromatography.

Heavy metal distribution and speciation in natural and waste water was investigated. Copper was selected as a heavy metal typically found in both municipal and industrial waste effluents. Experiments were conducted to determine the interaction of copper with inorganic and organic complexing ligands found in sewage and in receiving waters. Differential pulse anodic stripping voltammetry was used for an assessment of the metal-organic binding capacity of copper in sewage and processes effluents. This capacity was measured for effluents from four sewage treatment plants in Washtenaw County, Michigan. The organic content of the sewage (as quantified by TOC, COD,and BOD) was found to affect the degree of

complexation. Data suggested that the chemical parameters of TOC and COD might be used to predict binding capacity from one plant to another. Samples of raw influent and final effluent sewage were freeze-concentrated and fractionated by gel chromatography; molecular weight fractions suggested that copper binding is dependent on the degree of biodegradability of the organic material. With new methodologies for assessing metal distribution and speciation, it is suggested that heavy metal characterization in terms of degree and type of their complex formation, can be used to predict the availability of metal micronutrients and toxicity of metals to the environment. (Kramer-FIRL)
W76-02570

GULF STATES INSTALLS EFFLUENT TREATMENT, COLOR REMOVAL PLANT.
Paper Trade Journal, Vol 159, No 22, p 41-42, 44, September 15, 1975. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Treatment facilities, Suspended solids, Oxidation, Lagoons, Color, Sludge treatment, Dewatering, Costs, Operating costs, Activated sludge, Alabama.
Identifiers: UNOX, Filter presses, Clarification.

The Gulf States Paper Corporation's plant in Tuscaloosa, Alabama, built in 1928, is located on a lake 8.5 miles long formed by the Black Warrior River. New effluent and emission control laws have required the plant to greatly upgrade its treatment. The present system, which exceeds the goals of the EPA 1983 standards, includes: pumping mill effluent half a mile to a primary clarifier where the suspended solids are settled; bio-oxidizing effluent from the clarifier in a 4-stage UNOX activated sludge system to remove 86-90 percent of the BOD; decolorizing the UNOX stage effluent by reacting with alum-silica slurry; and, clarifying the treated effluent to remove the organic precipitate. The final effluent is discharged to a holding lagoon with a 10 day effluent flow capacity. Sludges from the primary and UNOX clarifiers and the decolorization stage are combined and dewatered in a Beloit-Passavant filter press. The dewatered sludge is incinerated in a multi-hearth Nichols Herreshoff furnace. Total cost of the project was about $7.6 million. The treatment plant can handle effluent flows of 14 mgd at a mill production of 750 tpd. Based on an average of 12,000 lbs BOD 5/day, the annual operating costs are $151,97/million gal of effluent. (Orr-FIRL)
W76-02571

SCOTTISH MILL TESTS RECOVERY SYSTEM.
Paper, Vol 184, No 4, p 202, August 18, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Equipment, Fibers, Recycling, Filtration, Suspended solids, Water reuse, Fiber(Plant).
Identifiers: Scotland.

A test program performed at a paper mill in the Aberdeenshire area of Scotland demonstrated the ability of the Mecatec Effluent Treatment System to recover fiber. The Mecatec Effluent Treatment System is a multi-purpose low-cost modular unit developed in the United Kingdom. It has been successfully used for general and industrial waste water treatment. The system has no moving parts and combines features of inertial and blanket filtration for the effective removal of particles. In addition to recovering fibers, the system recovers china clay and chalks. The trial run at the Aberdeenshire plant showed impressive separation of thick and thin fractions. With an input of about 14,000 gph, the overall clarification efficiency was between 85 and 95 percent. The clarified overflow, with an average of 140 ppm total solids, was used as shower water. The thickened underflow was returned to a saveall unit achieving a 400 percent increase in saveall drum efficiency. The recycled water resulted in a 50 percent reduction in mains intake. The fiber recovered should pay for the cost of the system in several months. (Orr-FIRL)
W76-02573

COMPLEX CHEMISTRY IN WASTE WATER TECHNOLOGY (KOMPLEXCHEMIE IN DER ABWASSERTECHNIK),
L. Hartinger.
Vom Wasser, Vol 44, p 69-117, 1975. 15 fig, 23 tab, 25 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Heavy metals, Chemical precipitation, Chemical reactions.
Identifiers: *Metal complexing agents, Complex chemistry.

One of the main problems encountered in the treatment of metal industry effluents is the presence of complexing agents in the waste streams. These complexing agents form compounds with heavy metals preventing precipitation of metal hydroxides during neutralization. The important considerations in the treatment of waste waters containing complexing agents are summarized. The most important rules of complex chemistry are presented as background material. In addition, the structures and stability constants of common complexing agents with metals are shown. Finally, some references for the treatment of metal complex solutions by precipitation, reduction and oxidation are given. (Orr-FIRL)
W76-02574

HYDROCHLORIC ACID EFFLUENT TREATMENT.
French Patent FR 2250-711. Issued July 11, 1975. French Patents Abstracts, Vol W, No 35, p D3, October 7, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Metals, Neutralization, Lime, Recycling, Byproducts.
Identifiers: Hydrochloric acid, Sulfuric acid.

A patent has been issued for a method of treating industrial effluents containing hydrochloric acid from metal rinsing baths. The effluents stream following the pickling operation, before hotdip galvanizing, is first neutralized with lime. Sulfuric acid is added to the resulting CaC12 solution to produce CaSO4 and a very dilute HC1 solution. The hydrochloric acid solution is recycled into the process cycle. The treatment method eliminates the formation of effluents with high salts content, such as CaC12 and NaC1, which are difficult to treat and cause serious pollution. The byproducts of treatment can be sold for use in paper manufacturing. (Orr-FIRL)
W76-02575

WASTE WATER TREATMENT.
Steel Times, Vol 203, No 9, p 788, September, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Steel, Metals, Separation techniques, Equipment, Flocculation, Water reuse, Dewatering.
Identifiers: *Magnetic separation, Magnadisc process.

The Magnadisc water treatment system is based on the magnetic separation of solid particles from polluted water. The process is especially suited to the treatment of effluents from steel works. Nonmagnetic materials can also be removed by the process. The system contains many stainless steel magnetic discs each containing a large number of permanent magnets. These discs rotate slowly against the direction of water flow; magnetic particles are attracted to the disc surfaces. The discs continue to rotate carrying the particles to a position where endless rubber belts scrape the particles off the discs and transport them to a disposal chute. The complete system also incorporates a flocculation tank to assist in the removal of nonmagnetic particles. An added flocculant causes the magnetic and non-magnetic particles for form magnetic flocs, which are then captured by the disc filter. Filter units are available with 5 to 30 discs, to deal with flows from 75 to 450 cu m/hr. Larger water flows are treated by increasing the number of filter units. The equipment has satisfactorily treated the effluent from the Storfors Steelworks, Sweden. The cleaned water at Storfors is recycled. The magnadisc system is very compact; the moving parts are few and slow-moving; and some dewatering of the sludge occurs as it moves with the discs. (Orr-FIRL)
W76-02576

REMOVAL OF HEAVY METALS FROM WASTEWATER BY FERRITE COPRECIPITATION,
Nippon Electric Co., Ltd., Kawasaki (Japan). Central Research Lab.
T. Okuda, I. Sugano, and T. Tsuji.
Filtration and Separation, Vol 12, No 5, p 472, 475-476, 478, September/October, 1975. 3 fig, 4 ref, 2 plates.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Heavy metals, *Chemical precipitation, Byproducts, Recycling, Iron.
Identifiers: *Ferrite, Magnetic properties, Japan.

A process has been developed for removing heavy metals from waste waters by converting them to ferrite precipitates with spinel structures and ferromagnetism properties. The formation of ferrite containing heavy metals requires a divalent ferrous salt, such as ferrous sulfates found in industrial wastes from steel and titanium oxide productions. Therefore, one industrial waste can be used to treat other industrial wastes. The process allows the simultaneous treatment of many kinds of heavy metal ions. The precipitates have high stability against redissolution, and can be removed magnetically, or by filtration. The final precipitate, ferrite, is an immediately usable ferrite-ferromagnetic product which can be used for ferrofluid and microwave absorption sheet. The process was tested with waste water discharged from Nippon Electric Company's Central Research Laboratories, Kawasaki, Japan. The effluent showed a degree of pollutant removal which cannot be achieved by conventional methods. The process has also been used for treating the effluent from the scrubbing tower for stack gas which is exhausted in incinerating municipal waste. All of the heavy metals contained in this effluent were converted to ferrite. (Orr-FIRL)
W76-02577

ADSORBENTS WIN HEAVY METALS FROM PROCESS STREAMS AND WASTES.
Chemical Engineering, Vol 82, No 20, p 49-50, September 29, 1975. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Heavy metals, Adsorption, Separation techniques.

The ALM Series of adsorbents and fixatives is the latest winner of Japan's Society of Synthetic Organic Chemistry's highest award for pollution control advances. The commercially proven, high-polymer products contain sulfur and nitrogen functional groups with high affinites for heavy metals. The products can reduce metal levels in effluents from 20-30 ppm to less than one ppm. The compounds are a superior alternative to heavy metals removal techniques such as alkali precipitation, ion exchange, and activated carbon adsorption. The compounds are useful in the following processes: mining; nonferrous metals production; photographic and battery cell plants; pigments and dyes facilities; sewage treatment plants; PVC

manufacturing; pharmaceuticals and final chemicals production; and other chemical operations. ALM-525 will adsorb cadmium, mercury, copper, lead, zinc, chromium, arsenic, nickel, and cobalt. ALM-125 can absorb up to 680 g of Hg/kg in aqueous solution and up to 340 g Hg/kg in 10% sulfuric acid solutions. ALM-648 can be used to fix sludge and soil; ALM-668 will fix organic mercury; and ALM-618 will fix sediment sludges. (Orr-FIRL)
W76-02578

RANGE OF PRODUCTS TO REDUCE OIL EFFLUENT LEVELS ANNOUNCED.
Australian Chemical Engineering, Vol 16, No 6, p 14, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Oily water, Separation techniques, Equipment, Filtration, Adsorption, Australia.

A full range of products to reduce oil levels in effluents is offered by Tecalemit Pty. Limited of Australia. The products all use CDA which is a modified form of ures formaldehyde with unique oil absorbing properties. Tecflake and Tecblock are CDA foam in flaked or solid form to be used in treating small oil spills, or floated in existing interceptor traps to assist oil or grease removal. The material is also an efficient hand cleaner with emollient properties. CDA Strainers are permanently installed in existing interceptor traps. All effluent discharged must pass through these strainers ensuring the removal of oil and grease. CDA filters are installed in more sophisticated interceptors. They provide a final polishing action on the effluent, achieving effluents with a hydrocarbon contamination of less than 5 ppm. (Orr-FIRL)
W76-02579

AMMONIA AND HYDROGEN SULPHIDE RECOVERY.
Netherlands Patents NL 146-461. Issued July 15, 1975. Derwent Netherlands Patents Report, Vol W, No 33, p D2, September 23, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Liquid wastes, Oil industry, Ammonia, Hydrogen sulfide, Patents.
Identifiers: Sour water stripping, Distillation columns, Refinery wastes energy.

A method for the recovery of ammonia and hydrogen sulfide from liquid effluents has been patented. Ammonia and H2S are separated from an aqueous solution by stripping in a first distillation column at high pressure and low temperature. Pure H2S vapor is removed from the top of the column, and the bottom aqueous product contains more NH3 and H2S. The bottom product is stripped in a second column, producing an aqueous effluent with considerably less NH3 and H2S, and a top product with a high concentration of NH3. The vapor containing a high level of NH3 is partially condensed at a lower temperature than that in the top of the column and most of the condensate obtained is recycled to the top of the second column. The NH3 concentration of the top vapor stream is increased by condensing water, so that the vapor obtained consists mainly of NH3. The noncondensed fraction contains the H2S and the water separated from the NH3, and the NH3 recovered. The non-condensed fraction is recycled to the column. The small fraction obtained from the top of the second column after condensation is recycled to the first distillation column. (Orr-FIRL)
W76-02580

REUSE SOUR WATER STRIPPER BOTTOMS,
Betz Lab., Inc., Trevose, Pa.
W. F. Maguire.
Hydrocarbon Processing, Vol 54, No 9, p 151-152, September, 1975. 1 fig, 1 tab, 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, Hydrogen sulfide, Ammonia, Water reuse, Recycling.
Identifiers: Sour water strippers, Distillation columns, Refinery wastes.

Sour water strippers are used to remove most of the sulfide and ammonia from refinery process waters. Sour water stripper bottoms (SWSB) are essentially distilled water and can be reused as desalter water, process wash water, cooling tower make up and/or boiler water makeup. SWSB are ideal desalter water if the hydrogen sulfide and ammonia are properly removed. Problems with use as desalter water include changing ammonia concentrations, cyanides which will transfer to the oil phase in a desalter, and the formation of ammonium naphthenate soaps due to an incorrect pH. SWSB have been used as process wash waters in catalytic cracker spray systems and overhead condensers for FCC main column and crude units with very few problems. The results of using SWSB as cooling tower makeup normally depend on stripper efficiency, cooling water treatment, and controls. Reuse of SWSB as boiler makeup depends on the existing external treatment equipment. Problems with this use include corrosion and deposition of sulfides, heat transfer and under-deposit corrosion attack from iron sulfide, ion exchange resin fouling and boiler foaming and carryover from oil contaminants in the stripper bottom, and ammonium bicarbonate deposits from the presence of ammonia. (Orr-FIRL)
W76-02582

COMPACT, LOW-COST INDUSTRIAL FILTER FROM PERMUTIT.
Australian Chemical Engineering, Vol 16, No 6, p 16, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Chemical industry, Metals, Food processing industry, *Filtration, *Filters, Equipment, Australia.

A new compact industrial tubular filter which provides high efficiency filtration at low cost has been developed by the Permutit Company of Australia Pty. Limited. The filter, Tubular Type 123, is designed for use with liquids used in the chemical, plating and food processing industries. It is suitable for polishing of corrosive or non-corrosive liquids containing a low percentage of solids, and can also be used as a trap filter together with other clarification equipment for the removal of fines. The unit consists of a number of perforated metal tubes inside a carbon steel, steel with rubber liner, or stainless steel shell and cover. Flat sheets of filter material, sometimes coated with diatomaceous earth, are rolled and inserted into the tubes. The unit may be cleaned by replacing the filter paper liners. A full range of sizes containing from one to 82 tubes and having filtration areas of 2.4 sq ft to 196.8 sq ft are offered. The units are available complete with pumping equipment or modified to be installed in existing process lines. (Orr-FIRL)
W76-02584

PURIFICATION OF WASTE WATERS CONTAMINATED WITH METHANOL (EPURAREA APELOR REZIDUALE IMPURIFICATE CU METANOL),
M. Balan, E. Dacin, and M. Manea.
Revista de Chimie, Vol 26, No 6, p 502-506, June, 1975. 6 fig, 8 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Methanol, Biological treatment, Biological treatment.
Identifiers: Physical treatment, Chemical treatment.

A study was performed on the use of physical, chemical, and biological techniques for the treatment of residual waters contaminated with methanol. The results obtained by each treatment method are presented. Good efficiency in treating methanol contaminated waters by biological means is achieved only up to a concentration of 300 mg/liter. (Orr-FIRL)
W76-02585

EFFLUENT YIELDS GYPSUM AND PURE WATER AT CYANAMID'S T102 PLANT,
A. Banov.
American Paint and Coatings Journal, Vol 60, No 12, p 20-21, 24-25, October 6, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Waste water disposal, Water reuse, Neutralization, Georgia.
Identifiers: *Gypsum, Magma.

Waste water disposal restrictions forced the Savannah, Georgia, titanium dioxide plant of American Cyanamid to spend about $20 million to convert their effluent into gypsum and pure water. Three types of acid wastes come from the plant: a concentrated stream containing about 20 percent sulfuric acid from the production stage where titanium hydrate is precipitated; weak acid from the tanks where titanium hydrolysate is washed free of impurities; and, cooling waters used in contact coolers. The strong acid goes to a pond lined with an impermeable Hypalon membrane with a working capacity of 200,000 gal, about one day's off-load of spent liquor. Reserve capacity can handle 15 days output. The acid is fed to neutralization reactors, where limestone is added to form carbon dioxide gas, which will be sold, and a slurry of almost pure gypsum. The remaining acid and dissolved salts are separated by settling and filtration and are passed to a final neutralization reactor where the waste is neutralized with slaked lime and the metals are precipitated as insolvent hydroxides. The combined gypdum-metal hydroxides and water are pumped to a two million gal settling tank. Cleaned water is reused in the plant. The gypsum-iron slurry, or magma, settles to the bottom of the tank and is pumped to a filtration system. The filtered water is combined with the cooling water in an effluent settling pond. Effluent from the pond overflows a dam through a metering device into the Savannah River. (Orr-FIRL)
W76-02586

SILVER RECOVERY DEVICE FOR PHOTO FIXER SOLUTIONS,
R. J. Cooper, and V. V. Carnell.
Canadian Patent 973,833. Issued September 2, 1975. The Patent Office Record, Vol 103, No 35, p 40, September 2, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Patents, Equipment, Silver, Cathodes, Anodes.
Identifiers: Photographic solutions.

A silver recovery device for the purification of photographic fixer solutions has been patented. A plastic cylindrical container with a removable top lid is adapted to receive a quantity of used photographic solutions. An anode strip is positioned in a spiral configuration adjacent to the inside walls of the container. The many turns of the anode strip decrease in axial spacing from top to bottom along the container walls. A cathode in the form of a flexible blade is suspended from the center of the container cover and extends along the full height of the container. A direct current power supply is connected to the anode through the top container wall and to the cathode through the container cover. Recovered silver is removed from the cathode by slightly flexing the blade surfaces. (Orr-FIRL)
W76-02587

LIQUID WASTE INCINERATION BY BALFOUR/NITTETU SYSTEM SOLVES EFFLUENT

PROBLEMS, CAN PAY FOR ITSELF OR EVEN TURN WASTE INTO PROFIT.
For primary bibliographic entry see Field 5E.
W76-02591

HARGREAVES CLEARWASTE TREATMENT CENTRE, WAKEFIELD.
Solid Wastes, Vol LXV, No 10, p 517-518, October, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Incineration, Ultimate disposal, Sludge disposal, Waste water disposal, Chemical wastes, *Treatment facilities.
Identifiers: Great Britain.

The Clearwaste Treatment Plant, commissioned and operated by the Hargreaves Group, Great Britain, was officially opened on July 23, 1975. The center is designed to dispose of toxic liquid wastes from industrial processes. Liquid wastes are rendered non-toxic by chemical treatment, resulting in settled sludges and clear non-toxic liquor. Final disposal of the sludge is incineration; the liquor is sent to the sewer. Pickling acids, waste acids, electro-plating solutions and alkali wastes are treated in this section. Incineration at 1200 C is used to detoxify waste solvents, waste and contaminated hydrocarbon oils, cutting oils, oil/water emulsions, tank cleaning residues and metal sludges. The storage capacity of the center is 90,000 gallons. Many of the storage tanks have resistant linings and will contain effluents to be treated, high C.V. wastes, low C.V. wastes and aqueous sludges. The center uses the Burdon system of effluent treatment which consists of dilution, reaction, separation and consolidation tanks. The process is semi-automatically controlled through a centrally-located control panel. Incineration is accomplished in a two-stage Peabody Holmes incinerator. (Orr-FIRL)
W76-02592

REACTOR FOR NEUTRALISING EFFLUENT.
Netherlands Patent NL 7317-740. Issued July 1, 1975. Derwent Netherlands Patents Report, Vol W, No 29, p J3, August 26, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Neutralization, *Patents, Equipment.

A reactor for neutralizing effluent has been patented. The reactor consists of two parts, the lower part tapers towards the bottom where it joins an outlet. A reagent stream is fed tangentially at the top of the vessel and forms a film which moves downwards on a spiral path. A second reagent is sprayed at right angles to the first film. The reactor is small, simple, rugged, and reliable. Other advantages include no internal moving parts, low energy requirements, and continuous operation with a high through-put. (Orr-FIRL)
W76-02593

HEAT TREATMENT OF WASTE SLUDGES,
Chicago Bridge and Iron Co., Oak Brook, Ill. (Assignee).
J. D. Paccione, and D. M. O'Meara.
U.S. Patent No 3,913,500, 6 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1237, October 21, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Water quality control, *Sludges, Industrial waste, Dewatering, Heat exchangers, Incineration, Waste disposal, Ultimate disposal.
Identifiers: Fluidized-bed reactor.

The invention involves the thermal conditioning of waste sludge by passing sludge, in heat exchange relationship, through the reaction zone of a fluidized-bed reactor, where the sludge is rapidly heated to the temperature required for thermal conditioning. In addition to facilitating the thermal conditioning of the sludge, the exchange of heat abstracts heat from the fluidized-bed reaction zone, which increases the capacity of the incinerator. After the desired conditioning the sludge is dewatered to produce an autogenous or supra-autogenous material which is incinerated in the fluidized-bed reactor without the addition of auxiliary fuel. The excess thermal energy can be used in heating the waste slurry which is to be thermally conditioned. In order to provide sufficient oxygen for the combustion of the increased amount of sludge, oxygen-enriched air or higher density bed material is used in the fluidized bed. (Sinha-OEIS)
W76-02597

SMALL BOAT OIL REMOVAL SYSTEM FOR BILGE WATER,
V. S. Pedone.
U.S. Patent No 3,913,513, 8 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1241, October 21, 1975.

Descriptors: *Patents, *Oil pollution, Water pollution control, *Filtration, *Oily water, Resins, Filters, Flow, *Waste water treatment.
Identifiers: Bilge water.

This patent describes a filtering system for removing small quanties of oil from water, particularly for use with small boats, although it may be used for other installations, such as industrial installation and swimming pool filter systems. The filter is provided with alternate layers of large particle expanded resin material and small particle expanded resin material. With a combination of large and small particles, it has been found that the large particles will permit the dispersion of the flow transverse to the general flow direction for distributing the flow, while the layer of small particles will satisfactorily remove the oil from the flowing water and be of a length in the direction of flow short enough to prevent channeling. The synthetic resin material that is chosen for the particles is preferably expanded polyurathane that will pick up between 50 and 70 times its weight in oil, without materially changing in size. With the material being tightly confined within a filter unit to prevent channeling, this ability to maintain its particle orientation and size while picking up oil is extremely important. A visual indicator is provided at the discharge end of the system to show when the filter should be replaced. (Sinha-OEIS)
W76-02598

SYSTEM AND PROCESS FOR BACTERIAL REDUCTION OF WASTES,
J. M. Clark.
U.S. Patent No 3,914,164, 9 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 939, No 3, p 1458, Ocotober 21, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Septic tanks, *Water pollution control, Water quality control, Soil disposal fields, Anaerobic bacteria, Biodegradation, Oxygenation, Protozoa.

An optimum environment is provided for the rapid and complete treatment of organically decomposable matter. Precisely size-controlled bubbles of oxygen and other gases gently mix a solution of waste with bacteria and oxygen in such a fashion that large numbers of protozoa and other higher life forms are available to graze upon aerobic microorganisms and enteric bacteria. Subsequent to this treatment, the treated effluent is subject to quiescence and clarification. The effluent is then low in biochemical oxygen demand and almost totally free of suspended and settleable solids, and enteric bacteria, and is suitable for discharge in receiving streams, ground, water, or upon the land. Aerobic conditions are promoted in both a septic tank extender unit as well as in the drain field. Electrolysis is used at a sufficiently reduced voltage so that bubble sizes are in a range from 100 to 800 microns (which range of sizes affords a gentle mixing function). Pure oxygen and hydrogen are produced, providing hydrogen acceptors for aerobic microorganisms, with the resultant improved quality of the effluent. (Sinha-OEIS)
W76-02599

METHOD AND APPARATUS OF TREATING INDUSTRIAL WASTE LIQUID,
Matsushita Electric Industrial Co. Ltd., Kadoma (Japan). (Assignee).
T. Sakagami, S. Kakumoto, K. Okawa, and K. Miyashita.
U.S. Patent No 3,915,691, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2047, October 28, 1975.

Descriptors: *Patents, *Industrial waste, *Waste water treatment, *Chemical wastes, Heavy metals, Mixing, Chemical reactions, Evaporation, Burning, Equipment, Liquid wastes.
Identifiers: Rare earth elements, High-molecular weight film, Color cathode ray tube manufacturing.

The method of treating an industrial waste liquid containing heavy metals formed in the process of manufacturing color cathode ray tubes consists of: mixing an aqueous waste liquid containing metallic powders selected from the group consisting of powders of metals, metallic compounds and mixtures thereof with a water-soluble high molecular weight compound selected from the group consisting of polyvinyl alcohol, methol cellulose, carboxy methyl cellulose, sodium alginate and sodium cellulose xanthogenate to form a liquid mixture; transferring the liquid mixture into a movable belt to spread it over the surface of the belt; subjecting the liquid mixture to temperatures between 100 deg C and 300 deg C to evaporate the water in the liquid and to concentrate the mixture; and cooling the concentrated mixture to form a solid film of the high molecular weight film-forming organic compound. The film contains the metallic powders embedded in the solidified organic high molecular weight film. The high-molecular compound film enables easy handling, storing and carrying. Reclaiming the metals from the concentrated compound can be made by burning the organic compound to leave the metals as residue. The treatment process produces no by-products except water vapors and there is no risk of salts or unreacted metals and added bases being dissolved and coming out. (Sinha-OEIS)
W76-02603

PROCESS OF PURIFYING WASTE WATER BY ELECTROLYSIS,
Nippon Risui Kagaku Kenkyusho (Japan). (Assignee).
T. Ito, and H. Yamazaki.
U. S. Patent No 3,915,820, 3 p, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2081, October 28, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water purification, *Electrolysis, Anodes, Cathodes, Chemical wastes, Dyes, Hydrogen ion concentration.

Waste water containing dye stuffs is purified by carrying out electrolysis in two steps. The electrolysis is characterized in that an iron anode and an aluminum or aluminum base alloy cathode are used at a pH of lower than 7 of the waste water, and an iron and a carbon cathode are used at a pH of higher than 7 of the waste water, and the electrolysis of the waste water is carried out in two steps at two different pH ranges of the waste water. The hydrogen ion concentration (pH) of the waste water to be purified is adjusted to about 4 when it is alkaline. An iron anode and an aluminum or aluminum base alloy cathode are dipped into the waste water and electrolysis is carried out by applying a DC voltage to the electrodes. As the electrolysis is continued with stirring, the pH goes up and a precipitate is formed. When the pH reaches

about 7, the electrolysis is stopped. The precipitate is removed by filtration. An iron anode and a carbon cathode are dipped into the precipitate-removed waste water and the second step of electrolysis is carried out by applying a DC voltage to the electrodes in the same manner. As the electrolysis is continued with stirring, a precipitate is formed and th pH goes up. When the pH reaches about 11, the electrolysis is stopped and the precipitate formed is removed to obtain the purified water. (Sinha-OEIS)
W76-02604

SEWAGE TREATMENT,
E. Luck.
U.S. Patent No 3,915,853, 7 p, 12 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2090, October 28, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, *Water quality control, Filtration, Precipitation, Enzymes, Microorganisms, Biodegradation, Neutralization, Hydrogen ion concentration.

A method of treating liquid sewage includes precipitating heavy metals from the sewage, which may have been previously settled, filtered or otherwise treated so as to remove a large proportion of the solids content. The pH of the sewage is raised to over 11 and prefereably over 12, to destroy pathogenic organisms and to release enzymes from bacteria in the sewage. Nest the pH is lowered so that it is in a range in which the enzymes digest components of the sewage. Seed bacterial, fungal or yeast organisms or a mixture are added to the sewage to assist in decomposing organic components. After substantial decomposition the sewage is acidified to kill the organisms developed from those seeded, the dead organisms and other insoluble materials are removed and finally the remaining liquid is neutralized. (Sinha-OEIS)
W76-02605

WASTEWATER TREATMENT,
Autotrol Corp., Milwaukie, Wis. (assignee)
W. N. Torpey.
U.S. Patent No 3,915,854, 6 p, 8 fig, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2090, October 28, 1975.

Descriptors: *Sewage treatment, *Patents, *Waste water treatment, *Domestic wastes, Water pollution control, Water quality control, *Biological treatment, Slime, Activated sludge, Oxidation, Trickling filters, Ammonia.

A process and apparatus is provided for simultaneously oxidizing carbonaceous matter and ammonia in wastewater. The process utilizes partially submerged rotating biological contactors such as discs, arranged in a single treatment state. By utilizing a single state of treatment and by control of the rate of feeding of wastewater to the slimes, the same surface is used to support both carbon and nitrogen utilizing organisms for their nutrition. The surface requirements for the critically loaded single stage unit has been shown to be determined by the nitrogenous oxidation requirements and no added surface need be supplied for the oxidation of carbonaceous matter. The oxidation of ammonia-nitrogen is carried out by specific organisms forming attached slimes whose efficiency is rate-limited by their metabolism. To accomplish a high degree of ammonia removal continuously, a holding tank should be provided after primary treatment that is large enough to absorb or dampen the flow and polutant concentration surges entering the plant. The single stage biological contactor treatment unit is integrated into existing activated sludge and trickling filter secondary treatment plants to utilize existing capital equipment to a maximum degree. (Sinka-OEIS)
W76-02606

METHOD AND APPARATUS FOR CONSERVING WATER,
W. O. Olson.
U.S. Patent No 3,915,857, 5 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2091, October 28, 1975.

Descriptors: *Patents, *Water reuse, *Water utilization, *Waste water treatment, *Water conservation, Water treatment, Filtration, Activated carbon, Domestic wastes.
Identifiers: 'White' water.

A process for conserving water in household systems is described. Waste waters from the non-sanitary and low-dissolved solids generating components of the system are accumulated and pooled. These waters are considered 'white water' and are effluents from laundry facilities, bath, shower, and wash basin. A closed loop recirculation of the accumulated waste water is established through a filter medium comprising of activated carbon for a time sufficient to remove substantially all undissolved solids and at least a portion of the dissolved solids. The filtered and clarified water is diverted from the closed-loop recirculation and accumulated to resupply the household water system.(Sinha-OEIS)
W76-02607

APPARATUS FOR THE TREATMENT OF WATER SOLUTIONS BY ION EXCHANGE,
Hager and Elsaesser, Stuttgart-Vaihingen (West Germany). (Assignee).
K. P. Marquardt.
U. S. Patent No 3,915,861, 7 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2092, October 28, 1975.

Descriptors: *Patents, *Waste water treatment, *Desalination, *Water purification, *Water softening, *Ion exchange, Water pollution control, Water quality control, Separation techniques, Equipment.
Identifiers: Regeneration.

A system is described for the treatment of water solutions by means of ion exchange masses, where the ion exchange masses through which the solutions flow are conducted in charges cyclically from a treatment container to a regeneration-and-wash column and in circulation are returned to the treatment container. The apparatus is comprised of a backrinse container, a regeneration-and-wash column and a treatment container. After leaving the liquid treatment container and before entering the regenerating-and-wash column, the ion exchange masses are back-rinsed in a back-rinse container. The ion exchange mass is transported from the regenerating-and-wash column by means of an immersion tube at the top of the regenerating-and-wash column, the depth of immersion of the immersion tube being adjustable according to the volume in the bottom funnel of the treatment container. Consequently the ion exchange mass in the head of the regenerating-and-wash-column which has been transported from the treatment container corresponds to the volume transported from the bottom funnel. (Sinha-OEIS)
W76-02609

SUBMERGED AIR RELEASE DEVICE PARTICULARLY FOR SEWAGE TREATMENT,
Envirex, Inc., Waukesha, Wis. (Assignee).
J. I. Moloney.
U. S. Patent No 3,915,862, 5 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2093, October 28, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, *Aeration, Aerobic treatment, Oxygenation, Diffusion.
Identifiers: Diffusers.

A corrosion-resistant, molded or cast diffuser body is directly attachable to a header provided with a plain round opening for a gas connection. The diffuser body snaps over the round header to secure it. The header with a number of diffusers attached is located in the tank so that the circulatory motion within the tank keeps the liquid within the lower open 'leg' of each diffuser in motion to prevent the liquid contents from accreting on and closing the diffusers. The diffuser is of a clean or entirely plain configuration and may comprise a single, integrally formed or molded structure. The diffuser may be used for diffusing any gas in any liquid but is in particular useful for the aeration of sewage in a sewage treatment plant. (Sinha-OEIS)
W76-02610

HYDRO-SEPARATOR FOR SLURRY,
Kurita Water Industries Ltd., Osaka (Japan). (Assignee).
H. Haji, H. Okada, and T. Takeuchi.
U. S. Patent No 3,915,865, 5 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2094, October 28, 1975.

Descriptors: *Patents, *Waste water treatment, Water pollution control, *Sludges, *Slurries, *Sludge treatment, Absorption, Dehydration, Separation techniques, Equipment.
Identifiers: Scrapers.

An apparatus is described for removing water continuously at high efficiency from a slurry-like substance such as sludge by use of a water-absorbing material. Two endless water-pervious belts are revolved circularly around the conveyor zones and the slurry to be dehydrated or the sludge is continuously fed to the belts by means of the respective slurry feed units. While in travel on the belts, part of the water contained in the sludge is first separated by virtue of gravitational attraction then allowed to pass through the belts and removed from the lower sides of the belts. The sludge continues to travel in conjunction with the belts and reaches the water suction drums which dehydrate the sludge and convert it into a concentrated sludge. During the travel between the upper and lower pairs of squeezing drums, the layers of sludge on the two belts are combined into one and squeezed to release the entrained water. The dehydrated sludge moves together with the belts and arrives at the returning conveyor zone, at which time the sludge is removed from the belt surface by means of the scraper. The belts which have this been deprived of the sludge further advance and return to the respective horizontal conveyor zones. (Sinha-OEIS)
W76-02612

RE-USE OF MUNICIPAL SEWAGE FOR PURPOSES OF SANITARY PROTECTION OF WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
S. N. Cherkinskii, P. P. Markov, and L. N. Gabrilevskaya.
Gig Sanit. 8. 70-72. 1974.

Descriptors: *Water reuse, *Reviews, *Sewage treatment, *Waste water treatment, Municipal wastes, Public health, United States, Mexico.
Identifiers: Japan, United Kingdom.

From a review of the literature are presented methods of treating sewage in some cities (USA, England, Japan, Mexico), where the municipal effluents are used again in recycled water cooling systems in the refining, petrochemical, metallurgical and paper industries. The composition of municipal sewage after treatment is given.--Copyright 1975, Biological Abstracts, Inc.
W76-02614

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: PETROLEUM REFINING INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W76-02618

CAPITAL INVESTMENT FOR WATER POLLUTION CONTROL AT THE STATE AND LOCAL LEVEL,
Frumkin (Norman), Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02620

OPTIMIZATION OF WATER ALLOCATION, WASTEWATER TREATMENT, AND REUSE CONSIDERING NON-LINEAR COSTS, SEASONAL VARIATIONS, AND STOCHASTIC SUPPLIES,
Utah Center for Water Resources Research, Logan.
A. B. Bishop, R. Narayanan, S. Pratishthananda, S. L. Klemetson, and W. J. Grenney.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 070, $6.00 in paper copy, $2.25 in microfiche. June 1975, Publication No PRWG123-2, Utah Water Research Laboratory, Logan. 126 p, 19 fig, 20 tab, 45 ref, 3 append. OWRT B-097-UTAH(1). 14-31-0001-4133.

Descriptors: Water reuse, Systems analysis, Linear programming, Water supply, Waste water treatment, Water costs, *Optimization, Seasonal, Water allocation(Policy), Water distribution(Applied), Utah, Model studies, River basins.
Identifiers: Lower Jordan River basin(Utah).

Using systems engineering and operations research techniques, this report focuses on the optimal management and use of water of impaired quality in a water resources system, including utilization of irrigation return flows and other poor quality water, water quantity and quality management systems, and wastewater reclamation opportunities. The study develops a mathematical programming transporation or transshipment model formulated for the Lower Jordan River Basin in Utah. The model incorporates all 'possible' water resources (including sequential and recycled reuse of water) to supply spatially separated multi-sector water users considering non-linear costs with economics of scale for water supply and wastewater treatment, temporal aspects of seasonality and stochastic nature of water supply and demand, and the system effects of higher wastewater treatment levels. The results of the model runs give specific allocations of water from the available sources to meet use sector requirements over a planning horizon for 1975 to 2020. The comparison of results from the model can be used to analyze the interdependence of water supply, water pollution control, options for water salvage and reuse in order to better plan public investment in water and wastewater management facilities.
W76-02636

TREATMENT OF KRAFT PULP WASTEWATER WITH LIME (III): TREATMENT OF THE INTEGRATED BLEACHING ALKALINE WATER WITH LIME (KURAFUTO PARUPU HAISUI NO SEKKAISHOR (III): SARASHI ARUKARI SOGO HAISUI NO SEKKAI SHORI),
T. Kubo, S. Katoh, and Y. Kimura.
Shikoku Kogyo Gijutsu Shikenjo Hokoku, (Report of the Government Industrial Research Inst. Shikokee), Vol 7, No 2, p 61-65, August 1975, 3 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Chemical oxygen demand, Biochemical oxygen demand, Lime, Lignins, Suspended solids.

Lime treatment of the alkaline waste water from the kraft pulp bleaching process for the removal of color and COD components was studied. The bleaching waste water containing a high BOD, was treated by a combination of activated sludge and lime. The combined treatment achieved about and 80% removal of COD and about an 85% removal of lignin. The continuous carbonation treatment process results in about a 40 ppm suspended solids (SS) level in the effluent from this process; this is less than the SS level in the lime treated waste water. The SS concentration in the effluent from the carbonation process can be lowered to less than 20 ppm by the addition of seed crystal. (Orr-FIRL)
W76-02654

REVIEW OF LANDSPREADING OF LIQUID MUNICIPAL SEWAGE SLUDGE,
Battelle Columbus Labs., Ohio.
T. E. Carroll, D. L. Maase, J. M. Genco, and C. N. Ifeadi.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-67012-75-049, June 1975. 95 p, 4 fig, 18 tab, 72 ref. 1BB043; ROAP 21ASE; Task O11. 68-03-0140.

Descriptors: *Sludge disposal, *Sewage sludge, Operating costs, Municipal wastes, Public health, Environmental effects, *Sewage treatment, Treatment facilities, Surveys, Waste water treatment.
Identifiers: Land spreading, Sludge characteristics, Sludge handling, Soil conditioners.

The objective was to review and summarize existing information regarding landspreading of liquid municipal sewage sludge. Emphasis was given to obtaining information concerning the number of sewage treatment plants currently using landspreading. A questionnaire survey of 1909 sewage treatment plants in Federal Regions 2, 3, 4, 5, and 9 was conducted and selected operations were visited. The information and data gathered during the study are summarized relative to sludge characteristics, sludge handling and distribution systems, economics of landspreading, sludge-soil-plant interactions, public health considerations, land acquisitions, and survey of sewage treatment plants. The survey indicated that about 21 percent of the plants in the study regions are using landspreading routinely. Sixty-eight percent of the plants using landspreading have been conducting the practice for less than ten years. Of this 68 percent, over two-thirds have begun the practice only within the last five years. (EPA)
W76-02658

REPLACEMENT OF ACTIVATED SLUDGE SECONDARY CLARIFIERS BY DYNAMIC STRAINING,
FMC Corp., Itasca, Ill. Environmental Equipment Div.
M. Joyce, W. Schultz, and A. Strom.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-670/2-75-045, May 1975. 75 p, 13 fig, 8 tab, 4 ref, 4 append. ROAP 21-ASR, Task 039 1BB043, 68-03-0102.

Descriptors: *Sewage treatment, *Activated sludge, Aeration, *Aeration lagoons, *Waste water treatment, Pilot plants, *Separation techniques.
Identifiers: Dynamic straining, Ultrasonic transducer, *Liquid-solids separation, Mixed liquor solids control, *Clarifiers.

Pilot plant studies were conducted on domestic wastewater to determine the feasibility of replacing conventional acitvated sludge gravitational clarifiers by dynamic straining. The dynamic strainers consisted of a rotating cylinder cleaned by an internal ultrasonic transducer. A primary strainer was placed and operated directly in the mixed liquor in the aeration tank. A secondary strainer was installed and operated in a separate tank to further clarify the effluent from the primary strainer. This work indicated that dynamic straining is a technically feasible process for replacing conventional activated sludge gravitational clarifiers. Suspended solids removals of well over 99 percent were achieved with a single primary strainer operating in the pilot plant aerator with a mixed liquor suspended solids concentration of over 6,500 mg/l. When operated at lower specific flow rates, primary staining appears to be capable of consistently producing an effluent suspended solids in the 15-30 mg/l range. Present economic predictions indicate that plants equipped with primary and secondary dynamic strainers would cost more than plants utilizing conventional secondary gravity clarifiers. This factor can be tempered by several projected dynamic straining advantages. Two-stage dynamic straining has excellent application where space limitations exist. Secondary gravity clarifiers could be eliminated under the right conditions and aeration tank sizes could be appreciably smaller with the higher MLVSS concentrrations achievable with dynamic straining. An existing overloaded activated sludge plant could be upgraded with primary straining only without expanding the facilities. In locations or applications where filamentous growth is prevalent, primary straining could be used to effectively control bulking. Durking the testing program, dynamic straining revealed itself to be resistant to shock loading. (EPA)
W76-02662

HIGHWAY AND SEWER IMPACTS ON URBAN DEVELOPMENT,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W76-02717

CHARGE-MOSAIC MEMBRANES,
Harvard Medical School, Boston, Mass. Biophysical Lab.
For primary bibliographic entry see Field 3A.
W76-02734

THE EFFECT OF INCREASING THE ORGANIC CARBON CONTENT OF SEWATE ON NITROGEN, CARBON, AND BACTERIA REMOVAL AND INFILTRATION IN SOIL COLUMNS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
J. C. Lance, and F. D. Whisler.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 57-65, 1 tab, 4 fig, 19 ref.

Descriptors: *Denitrification, *Filtration, *Sewage, *Sewage treatment, *Soil filters, Sewage bacteria, Sewage effluents, Carbon.
Identifiers: Organic carbon.

Denitrification is the only reaction capable of removing the tremendous quantity of nitrogen applied when high-rate land filtration systems are used for renovating sewage water. This study determined that a shortage of organic carbon limits denitrification, and the effects of increased dissolved organic carbon concentrations on soil clogging and movement of fecal coliform bacteria are clearly shown. Finally, the removal of dissolved organic carbon at different carbon concentrations during high rate soil filtration (40-50 cm/day) also limits denitrification. (McLachlan-Arizona)
W76-02741

APPLICATIONS OF DIRECT OSMOSIS: DESIGN CHARACTERISTICS FOR HYDRATION AND DEHYDRATION,
Arizona Univ., Tucson. Dept. of Physics.
J. O. Kessler, and C. D. Moody.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 91-100, 3 fig, 8 ref, 1 append.

Descriptors: *Osmosis, *Hydration, *Dehydration, *Semipermeable membranes, Water pollution, Industrial wastes, Irrigation water, Hydrostatic pressure, *Waste water treatment.

In direct osmosis water automatically flows through a semipermeable membrane from a source solution of low concentration to a driving solution with higher solute content. The process requires a membrane which is impermeable to the solutes; hydrostatic pressure differences are not directly involved and can be set equal to zero. This study summarizes basic physical principles and introduces some quantitative design factors which must be understood on both a fundamental and an application level. In principle, direct osmosis is a low-technology, low-power consumption method for reducing the water volume of industrial effluents or liquid agricultural products, and for reclaiming brackish irrigation water. In the latter application the driving solution may utilize fertilizer as a solute. The source solution is drainage that contains harmful salt components. (McLachlan-Arizona)
W76-02745

APPLICATION OF DIRECT OSMOSIS: POSSIBILITIES FOR RECLAIMING WELLTON-MOHAWK DRAINAGE WATER,
Arizona Univ., Tucson. School of Renewable Natural Resources.
C. D. Moody, and J. O. Kessler.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Adademy of Science, April 11-12, 1975, Tempe, Arizona, p 101-111, 2 fig, 3 tab, 9 ref.

Descriptors: *Osmosis, *Drainage water, *Fertilizers, *Arizona, *Reclaimed water, Water pollution, Nitrogen, Brackish water, Water reuse.
Identifiers: *Ammonium sulfate, Yuma Valley(Ariz), Imperial Valley(Calif), Welton-Mohawk Irrigation and Drainage District.

A direct osmosis plant can reclaim twenty to thirty thousand acre feet of Wellton-Mohawk brackish drainage water using no more nitrogen fertilizer than is normally used in the Yuma, Coachella Valley, Imperial Valley and the boardering Mexican areas. On a per-acre basis ammonium sulfate-driven direct osmosis can reclaim about one percent of the total irrigation requirement from 3000 ppm brackish water. In addition to the ammonium sulfate-driven direct osmosis efficiency, the by-product energy recovery of the manufacture of the fertilizer and the low technology inherent in direct osmosis processes make direct osmosis an appealing water reclaiming process. (McLachlan-Arizona)
W76-02746

SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: RESEARCH RESULTS,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W76-02757

WATER QUALITY MANAGEMENT PLANNING FOR URBAN RUNOFF,
URS Research Co., San Mato, Calif.
G. Amy, R. Pitt, R. Singh, W. L. Bradford, and M. B. LaGraff.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-440/9-75-004, December 1974. 214 p, 36 fig, 38 tab, 162 ref, 4 append. EPA 1BB034/ROAP 21 ATB/Task 76B, 68-01-1846.

Descriptors: Drainage, Water pollution, Surface waters, *Runoff, *Water quality, *Storm sewers, Hydrology, Hydraulics, *Mathematical models, *Urban runoff, Water pollution control, Urban hydrology, Drainage systems, Water management(Applied).
Identifiers: Drainage systems.

This manual provides technical assistance to state and local water quality management planners to enable them to quantify within reasonable limits the urban non-point water pollution problem in a local planning area without extensive data generation, and to make a preliminary evaluation of cost effective abatement and control practices. The manual prescribes procedures for several levels of input, each requiring more self-generated data, with increasingly sophisticated results. A state-of-the-art and an extensive bibliography on urban story water runoff is presented in the appendix. A glossary is also included. The manual is not intended to be used as a basis for abatement design but does provide a guide to data generation for this purpose. (EPA)
W76-02758

AN ALTERNATIVE SEPTAGE TREATMENT METHOD: LIME STABILIZATION/SAND-BED DEWATERING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
W. A. Feige, E. T. Oppelt, and J. F. Kreissl.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 816, $4.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/2-75-036, September 1975. 52 p, 14 fig, 10 tab, 17 ref. EPA 1BC611.

Descriptors: *Waste water treatment, *Septic tanks, Lime, *Dewatering, Sludge disposal, Costs, Treatment facilities.
Identifiers: *Sand bed dewatering, *Septage, *Lime stabilization.

Approximately 5 billion gal (18,927,000 m3) of septage must be annually disposed of in the United States, a volume that is nearly equal to that of undigested raw and secondary municipal sludges. Few desirable methods exist for disposing of the sludge that is periodically pumped from septic tanks. Results are presented from a pilot study of one alternative septage treatment method - lime stabilization followed by covered sand-bed dewatering. The study was conducted in two phases. Phase I (4 months) consisted of the general, chemical, and biological characterizations of the incoming septage. Attempts were made to thicken the material via stirring, polyelectrolyte addition, and lime addition. Phase II (9 months) concerned itself with the application of lime septage onto covered sand beds. Four experimental runs were conducted to assess the feasibility of such an approach. The septage was limed to pH 10.5, 11.0, and 11.5 and applied at 8-in (20.3-cm) depths. Underdrainage and cake characteristics were monitored and practical sand-bed application rates were determined. A materials balance of chemical constituents around the system was made. A cost estimate for the treatment of septage at small treatment plants via this method is included. (EPA)
W76-02759

ACTINOMYCETES OF SEWAGE-TREATMENT PLANTS,
Rutgers - The State Univ., New Brunswick, N. J. Waksman Inst. of Microbiology.
H. A. Lechevalier.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 914, $4.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/2-75-031, September 1975. 62 p, 23 tab, 19 ref. EPA 1BB043 (ROAP 21-ASR, Task 038), R802003 (17050 GUJ).

Descriptors: *Actinomycetes, *Activated sludge, Microorganism, *Aeration, *Sewage treatment, *Waste water treatment, Foaming isolation.
Identifiers: Digester supernatant, Nocardia amarea, Aeration tanks.

In some sewage-treatment plants of the activated sludge type, a thick foam may be formed at the surface of the secondary aeration and settling tanks. Such foams have often been found to be rich in actinomycetes. This report covers the work done on this problem between April 1971 and May 1974. Over 250 strains of actinomycetes have been isolated from foams or activated sludge from 19 different sewage-treatment plants located in 8 states. The actinomycete most commonly associated with foams is a previously underscribed Nocardia which has been given the name N. amarae. It has been domonstrated experimentally in the laboratory that N. amarae may cause the kind of foam observed in the plants. Factors affecting the growth of N. amarae have been studied and a method of control of the foam by addition of digester supernatant to the activated sludge is proposed. (EPA)
W76-02760

HATFIELD TOWNSHIP, PENNSYLVANIA, ADVANCED WASTE TREATMENT PLANT,
Tracy Engineers, Inc., Camp Hill, Pa.
T. W. Greenlund, and F. R. Gaines.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 622, $7.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/2-75-030, September 1975. 223 p, 40 fig, 46 tab, 14 ref, 6 append. EPA 1BB043 (ROAP 21-ASO;Task 046). 11060 FRQ.

Descriptors: *Waste water treatment, *Activated sludge, *Nitrification, *Filtration, Phosphorus, *Tertiary treatment, *Coagulation, Water quality standards, Lime, Pennsylvania, *Treatment facilities.
Identifiers: Phosphorus control, Effluent standards, Lime coagulation, Alum precipitation, *Flow equlization.

The Hatfield Township, Pennsylvania, Water Pollution Control Plant was designed to encompass primary chemical treatment, secondary combined activated sludge and nitrification facilities, tertiary chemical tube clarification and mixed media filtration. The operation of the facility demonstrated that the use of flow equalization facilities improves plant operations by reducing and stadardizing chemical concentrations. Phosphorus is removed efficiently in a combined primary-tertiary phase with operations personnel having the flexibility to optimize each process. Lime feed control by pH is easily accomplished, although recirculation of primary sludges is not always necessary. Tube clarifiers and mixed media filters combine to produce a highly polished effluent. Nitrification was observed to some extent in this modified facility; however, it was extremely difficult to control. (EPA)
W76-02761

POLLUTION ABATEMENT FROM CATTLE FEEDLOTS IN NORTHEASTERN COLORADO AND NEBRASKA,
Agricultural Research Service, Fort Collins, Colo.

L. K. Porter, F. G. Viets, Jr., T. M. McCalla, L. F. Elliott, and F. A. Norstadt.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-246 242, $5.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-015, June 1975. 120 p, 27 fig, 34 tab, 53 ref. EPA 1BB039. EPA-IAG-D4-0446.

Descriptors: *Farm wastes, Cattle, *Feed lots, *Nebraska, Waste identification, Waste disposal, *Pollution abatement, *Colorado, Agricultural runoff, *Waste treatment.
Identifiers: Land application, Water pollution potentials, Wastes characteristics.

Climatic factors, feedlot runoff, and organic material in the runoff were evaluated in experimental and commercial feedlots. The effects of slope, stocking rates, terraces, basins, and holding ponds were evaluated to obtain the best controls for containing runoff. In eastern Nebraska, 70 cm annual precipitation produces 23 cm of runoff; whereas, in northeastern Colorado, 37 cm annual precipitation gives only 5.5 cm of runoff. Large applications of runoff liquid, up to 91 cm on grass-Ladino and 76 cm on corn, in Nebraska did not decrease yields; however, in northeastern Colorado, the concentrated high-salt runoff required dilution before direct application to crops. The organic manure-soil interface severely restricts the movement of water, nitrates, organic substances, and air into the soil beneath feedlots. The amounts of NO3-N in soil cores taken from Nebraska feedlots and croplands ranked as follows: abandoned feedlots > feedlot cropland > upland feedlots > river valley feedlots > manure mounds > alfalfa > grassland. Feedlots contribute NH3, amines, carbonyl sulfide, H2S, and other unidentified substances to the atmosphere. Ammonia and amine can be scavenged from the air by green plants and water bodies. Anaerobic conditions in feedlots are conducive to the production of carbonyl sulfide, H2S, and amines. Management practices, such as good drainage, that enhance aeration will decrease the evolution of these compounds. (EPA)
W76-02762

CHEMICAL COAGULATION/MIXED MEDIA FILTRATION OF AERATED LAGOON EFFLUENT,
Amoco Oil Co., Yorktown, Va.
J. F. Grutsch, R. C. Mallatt, and A. W. Peters.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 148, $5.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/2-75-025, June 1975. 103 p, 44 fig, 5 tab, 7 ref, 7 append. EPA 1BB036. S803026-01.

Descriptors: *Filtration, Particle size, *Coagulation, Construction, Costs, *Aerated lagoons, *Waste water treatment, Zeta potential, Operation and maintenance, Treatment facilities.

Operating problems and the effect of operating variables were investigated during fullscale plant operations in the scalping mode. Influent suspended solids concentration and water temperature were the most significant independent variables. Mechanical limitations were studied, including a filter bed disturbance that necessitated a total bed replacement. High, localized backwash velocity caused the invisible disturbance which reduced turbidity removal from about 80 percent to 50 percent. Diagnostic procedures, design changes, and the costs of operation and maintenance are reported. A cold weather study showed that a three-chemical destabilization pretreatment system is required for filtration of biocolloids in brackish water. Determination of the optimal three-chemical destabilization system using zeta potentials required evaluation of zeta potentials in a manner which sorted out the effect of double-layer repression. The colloid destabilization mechanisms of charge neutralization and bridging were required for optimal filter performance. For colder water temperatures, even with optimal chemical treatment, the filter hydraulic loading must be decreased. The change in hydraulic loading with temperature related directly to the water's viscosity. (EPA)
W76-02763

SURVIVAL OF PATHOGENS IN ANIMAL MANURE DISPOSAL,
Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5C.
W76-02765

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5F.
W76-02766

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIX A.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5F.
W76-02767

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIXES B AND C.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5F.
W76-02768

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIX D.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5F.
W76-02769

EFFLUENT TREATMENT PROCESSES,
Gulf States Paper Corp., Tuscaloosa, Ala. (Assignee).
R. R. Fuller.
United States Patent 3,740,363, Issued Jun 19, 1973. Official Gazette of the United State Patent Office, Vol 911, No 4, p 1008-1009, June, 1973. 1 fig.

Descriptors: *Waste water treatment, *Pulp and paper industry, *Industrial wastes, *Patents, Effluents, Color, Chemical precipitation, Sludge treatment, Dewatering, Water reuse.
Identifiers: Decolorization.

A waste effluent treatment process which involves contacting a waste effluent with a metal salt reagent, preferably alum mud, has been patented. The method is applicable for the treatment of pulp and paper mill wastes. Effluent is odorized and a substantial portion of the organic content is precipitated. This precipitate and the sludge is dewatered, then calcined, and the reagent is regenerated from the ash for use again in a cyclic process. The decolorized effluent is biooxidized in a multistage sequence and subsequently is sufficiently pure for recycle purposes. The purified effluent may also be bleached prior to recycle. (Sandoski-FIRL)
W76-02771

PROCESS FOR TREATING PULP,
P. E. Schick.
Canadian Patent 925,657, Issued May 8, 1973. Patent Office Record, Vol 101, No 19, p 1482, May, 1973.

Descriptors: *Waste water treatment, Pulp and paper industry, *Industrial wastes, *Pulp wastes, Oxidation, Temperature, Patents.
Identifiers: Sulfite pulping wastes.

A process to simultaneously produce sulfite pulping chemical from a spent pulping medium by the exothermic oxidative conversion of sodium sulfide to sodium sulfite has been patented. The temperature in exothermic reactions is controlled and the reaction heat is utilized to produce steam to be mixed with air for use in the oxidation process. Ground particles of a spent pulping smelt are treated in a fluidized bed reactor in contact with moving air enriched with steam for about ten seconds to two hours. The weight ratio of steam to air ranges from about 0.2:1 to 1.2:1. The temperature in the reactor is adiabatically controlled and the heat of reaction generated in the reactor is absorbed by adiabatic cooling to form the steam used in the reactor. (Sandoski-FIRL)
W76-02773

PROCESS FOR THE RECOVERY OF WASTE PICKLE LIQUOR,
L. J. Hansen.
United States Patent 3,745,207, Issued July 10, 1973. Official Gazette of the United States Patent Office, Vol 912, No 2, p 676, July, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Iron, Oxidation, Water reuse.
Identifiers: *Waste pickle liquor, Metal industry.

A process for the recovery of waste pickle liquor has been patented. In the process, waste acid pickle liquor is converted into iron oxide and acid by depositing it on a compact moving bed and sweeping the bed with hot oxidizing gases. (Sandoski-FIRL)
W76-02774

NEW TECHNOLOGY FOR A WIDE RANGE OF PROCESSES FEATURED AT ACHEMA.
Chemical Age International, Vol 107, No 2816, p 11, 17, July 6, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Chemical wastes, Oxidation.
Identifiers: *Japan, Catalytic oxidation.

The Chiyoda Chemical Engineering and Construction Company Limited of Japan has developed a new process entitled Chiyoda Thoroughbred 101 Flue Gas Desulphurisation Process. Operating successfully at four plants in Japan, the process is based on the absorption and catalytic oxidation of sulfur dioxide in a dilute solution of sulfuric acid and dissolved catalyst, ferric sulfate, that serves as the absorbent. The absorbed sulfur dioxide then reacts with the oxygen charged to the unit in the form of air, to form sulfuric acid. The acid is withdrawn and can be treated with one of the following compounds: limestone, quicklime, calcium oxide, slaked lime, calcium hydroxide, or carbide residue. The sulfate ion is thus precipitated as gypsum. Clogging problems in the system due to the formation and recycling of calcium sulfate are avoided by the increased solubility of the compound in increasing strengths of acid in the absorber. Poisoning effects with an iron catalyst are minimal and the activity of the catalyst reaches that of the conventional manganous sulfate catalyst between 40 C and 60 C. Soluble and corrosive salts accumulating in the absorbent are removed by economical purging. (Sandoski-FIRL)
W76-02776

METHOD FOR MANUFACTURING SULFITE PULP COOKING LIQUOR FROM SULFITE PULP SPENT LIQUOR,
A. Mita, and T. Ishida.
Canadian Patent 928,009, Issued June 12, 1973. Patent Office Record, Vol 102, No 24, p 1930, June, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, *Patents.
Identifiers: Sulfite pulp, Calcium sulfate.

A method for manufacturing sulfite pulp cooking liquor from sulfite pulp spent liquor has been patented. Sulfite pulp cooking liquor is produced from sulfite pulp spent liquor by combusting condensed sodium-based spent liquor in an oxidizing atmosphere, adding a calcium compound, and blowing sulfur dioxide gas into an aqueous solution of the ash. This produces an aqueous solution of sodium bisulfite containing calcium sulfate and separates out the calcium sulfate. Alternately, the condensed spent liquor may be combusted in a reducing atmosphere with sulfuric acid added to the resultant smelt to produce an acid solution to which a calcium compound is added and into which culfur dioxide gas is blown. (Sandoski-FIRL)
W76-02777

INTEGRATED WASTE WATER TREATMENT FOR REUSAGE AFTER CYANIDE TYPE PLATING,
L. E. Lancy.
Canadian Patent 929,839, Applied October 27, 1970. Issued July 10, 1973, Patent Office Record, Vol 103, No 27, July, 1973.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chelation.
Identifiers: Plating wastes.

A method for the treatment of solution containing a chelating compound and a dissolved content of plating metal has been patented. Under this patent, used or waste wash water treatment solution from individual cyanide type plating lines that apply coatings of different metals on workpieces is treated with a salt of such metals as calcium, barium, lithium, aluminum, and magnesium. The salt acts as an exchange element in the chelating compound to replace a more noble dissolved metal content in the wash water treatment solution. It is then reused to rinse drag-out from workpieces being processed in the different plating lines. (Sandoski-FIRL)
W76-02779

RECYCLING BRINE FROM PICKLING,
J. R. Geisman, and R. E. Henne.
Ohio Report, Vol 58, No 4, p 76-77, July/August, 1973, 2 tab.

Descriptors: *Recycling, *Brines, *Industrial wastes, Waste disposal, Coagulation, Filtration, Chemical precipitation, Laboratory tests, Food processing industry.
Identifiers: Pickling wastes.

Laboratory studies were conducted to screen standard water treatment chemicals for coagulation of suspended solids in pickling brine. Using a treatment which produced maximum coagulation, the laboratory tests were increased in scale and an attempt was made to continuously filter the treated brine. Research also was conducted at a pickle processing plant using larger quantities of spent brine to determine operating costs and feasibility of operation. Of the five water treatment chemicals screened, sodium hydroxide was effective and inexpensive. In further testing, it was found that adjusting the brine pH to 11 with sodium hydroxide resulted in a heavy precipitate. At this pH a filtrate with no protein was produced. A laboratory scale filter was constructed, including an activated charcoal bed for final filtration. The end product was a colorless brine containing no carbohydrates or proteins. Final pH adjustment was made with hydrochloric acid to the neutral point, producing water and salt. After extensive tests at the pickling plant, it was determined that treatment of the spent brine for reuse results in a savings for the processor. (Sandoski-FIRL)
W76-02782

SEPARATION, DEWATERING AND DISPOSAL OF SUGAR BEET TRANSPORT-WATER SOLIDS,
American Crystal Sugar Co., East Grand Fords, Minn.
I. V. Fordyce, and A. M. Cooley.
Sugar y Azucar, Vol 68, No 7, p 17-20, July, 1973, 4 tab.

Descriptors: *Food processing industry, *Filtration, *Waste water treatment, Alkalinity, Lime, Sugar beets, Industrial wastes, Dewatering, Waste disposal, Flow rates.
Identifiers: Vacuum filtration.

Vacuum filtration of thickened underflow from clarification of beet wash and transport water was achieved at reasonably high rates by use of an Eimcobelt filter. The solids content of the slurry was an important factor, with best results being obtained when solids content in the feed were above 10% and preferably over 20%. The addition of calcium hydroxide to slurries with pH values of around 11 improved filtration rates; at pH values near 7, there was very little pickup of cake. Research results further indicated that the recovery of an alkaline pH is difficult to achieve with the use of lime alone, but can be accomplished by the use of paraformaldehyde in the transport water at a 0.02% dosage. Lime alone can be used in reasonable amounts for pH control and bacterial control, after formaldehyde has been used as a bactericide. Both lime cake and fly ash were effective filter aids. Addition of lime filter cake from juice purification to the clarifier gave an underflow with the best filtration characteristics of the combinations tried. (Sandoski-FIRL)
W76-02783

DEWATERING OF DISTILLERY SPENT WASH IN THE PRODUCTION OF BY-PRODUCT DREG MEAL,
R. M. Kerr.
United States Patent 3,747,758. Issued July 24, 1973. Official Gazette of the United States Patent Office, Vol 912, No 4, p 1406, July, 1973. 1 fig.

Descriptors: *Patents, *Dewatering, *Food processing industry, *Centrifugation, Screens, Treatment facilities, *Waste water treatment, Waste disposal, Dissolved solids, Suspended solids.
Identifiers: *Whisky production wastes, Distillery wastes.

A patented method and apparatus for recovering dissolved and suspended solids from a process for the production of grain whisky is described. The wort from a mashing tun or spent wash from distillation plant is fed onto a continuously moving filter screen in the form of a continuous belt. The filter screen moves at several hundred feet per minute so that a major portion of the liquid filters by gravity, leaving on the screens a random dispersion of solids. The screens containing solids are passed over a vacuum station for further dewatering. Dewatered solids are removed by adhesion to at least one roller where they are removed by centrifugal force into a hopper. (Sandoski-FIRL)
W76-02784

A NEW METHOD FOR THE PURIFICATION OF SUGAR-PRODUCING PLANT-GENERATED WASTE WATERS AT THE BMA ENTERPRISES (NOVVY SPOSOB OCHISTKI STOCHNYKH VOD SAKHARNYKH ZAVODOV FIRMY BMA),
B. M. Shakhnovich, and K. V. Sizov.
Sakharnaya Promyshlennost', No 6, p 71-72, 1973, 1 fig.

Descriptors: *Waste water treatment, *Food processing industry, *Activated sludge, *Biological treatment, Aeration, Biochemical oxygen demand, Anaerobic treatment, Retention.

A new 99% efficiency biological method for the purification of sugar factory-generated waste water, which requires minimum space and time, has been introduced at the BMA Company in West Germany. The BOD content is reduced from an average of 3000 mg/liter to 30 mg/liter and maladorous emissions are prevented. The effluents are first treated in an anaerobic basin, after which mineralization is achieved by means of aeration and activated sludge in another activated sludge aeration basin. The BOD value of the effluent decreases by 30 to 50% due to retention of 2.5 days in an anaerobic collector. (Takacs-FIRL)
W76-02785

PETROCHEMICAL WASTES.
Effluent and Water Treatment Journal, Vol 13, No 6, p 383, June, 1973.

Descriptors: *Oil wastes, *Anaerobic treatment, *Pre-treatment, Lagoons, Pilot plants, Chemical oxygen demand, *Waste water treatment, Industrial wastes, Retention.
Identifiers: *Petrochemical wastes.

The Union Carbide Corporation has studied anaerobic lagoon pre-treatment of petrochemical wastes. A pre-treatment stage by anaerobic lagoons was tested, principally on a pilot scale, in two lagoons 50 by 100 ft and at depths of 6 and 12 ft. A retention time of 15 days was maintained in each lagoon, and samples were analyzed for BOD, COD, pH, volatile acids, alkalinity, total carbon, and sulfur compounds. Batch experiments showed that the bottom sludge and surface photosynthetic layers both could provide about 50% COD reduction. Intermediate layers provided a lower treatment level of about 20%. Continuous flow experiments in which natural mixing was allowed between zones indicated that the influence of depth on COD removal was slight; however, surface sulfide levels were quite dependent on depth, being lower at shallower depth. Lagoon temperature, particularly for winter conditions, was also a function of depth. Lagoon performance was correlated with volumetric-organic loading and temperature for a number of lagoon installations treating various petrochemical wastes. (Sandoski-FIRL)
W76-02786

AUTOMATIC SELF-CLEANING SIEVE FILTERS FOR INDUSTRIAL AND COOLING WATERS (AUTOMATISCH SELBSTREINIGENDE SIEBFILTER FUER BETRIEBS-UND KUEHLWASSER).
Technica, Vol 22, No 12, p 1186-1187, June, 1973. 4 fig.

Descriptors: *Filters, *Cleaning, *Chemical wastes, *Cooling water, Powerplants, Industrial wastes, Food processing industry, Waste disposal, Iron, Steel, Plastics, Chemical industry, Steel pipes.

The Q-15 Series II Royles-Adams Poro-Edge-Strainers, which are automatic self-cleaning tube filters, have throughput capacities up to 320,000 liters per minute. The tube filter is formed by a bundle of 12 to 157 pipes made of stainless steel formed in such a manner that wire with a trapezoid cross-section is spirally wound over parallel rods to which it is welded by an underwater welding process. V-slots of 125 to 250 microns are formed between two adjacent turns which retain solid particles present in the liquid without increasing the filter resistance at any throughput capacity. The maximum operating pressure is 10.5 kg/sq cm and when pressure loss reaches a preset value, counterflow flushing starts automatically. The self-cleaning sieve filters can be used to protect pumps in powerplants and waste water treatment facilities, and to purify industrial and cooling water in the plastics, iron and steel, food processing, chemical, and pharmaceutical industries. (Takacs-FIRL)
W76-02787

THICKENING SEWAGE/WASTE-WATER.
Netherlands Patent NL 7213266. Issued May 24, 1973. Derwent Netherlands Patents Report, Vol U, No 24, p D1, May, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Sewage treatment, Sludge treatment, *Patents, Flocculation, Polymers, Coagulation.
Identifiers: Thickening, Chemical treatment.

A patent has been issued for a method of thickening of sewage and/or industrial waste water. An aqueous solution of a water soluble vinyl addition polymer (formed by the inversion of a polymer latex) is added, under flocculating conditions to the waste liquid to be treated. The solids are permitted to decant forming a clear supernatant layer. The latex is prepared by forming a water-in-oil emulsion from: water containing a dissolved ethylenically unsaturated monomer to form a monomer phase forming 30-70 weight percent of the emulsion; an inert hydrophobic liquid, 0.1-10 weight percent of a water-in-oil emulsifier; and a free radical initiator. The emulsion is heated to generate free radicals and polymerize the monomer in the water to form a polymer latex. The system has a high coagulating efficiency and eliminates the need for dissolving a solid polymer. (Sandoski-FIRL)
W76-02788

FLUIDIZED BED ION EXCHANGER TO BE USED FOR EFFICIENT TREATMENT OF POLLUTED LIQUID WASTE.
Industrial Heating, Vol 40, No 9, p 1642, September, 1973.

Descriptors: *Industrial wastes, *Ion exchange, *Treatment facilities, Effluents, Water pollution control, *Waste water treatment, Liquid wastes.
Identifiers: Fluidized bed ion exchanger.

A new commercial size fluidized bed ion exchanger will be used at a large Tennessee smelting plant for the treatment of highly polluted liquid waste. Designed and fabricated by Liquitech Incorporated, the system continuously treats 600 gallons per minute and allows the water to be recycled or safely vented to public water bodies. The fluidized bed approach may be applied to systems now served by conventional ion exchangers. In addition to increased regenerant efficiencies and significant reductions in plant size and waste effluent volumes, the method defines an economic method of water pollution control. (Sandoski-FIRL)
W76-02789

PURIFICATION OF EFFLUENT CONTAINING HEAVY METALS.
Belgian Patent BE 797616. Issued July 16, 1973. Derwent Belgian Patent Abstracts, Vol U, No 37, p D4, July, 1973.

Descriptors: *Patents, *Heavy metals, *Waste water treatment, *Industrial wastes, Chemical precipitation, Ion exchange, Metals, Chromium, Nitrates, Lead, Iron, Aluminum, Zinc.
Identifiers: Cyanide.

A purification method for effluent containing heavy metals has been patented. In this process industrial effluent is treated by the removal of heavy metal ions by chemical displacement with a more electropositive cheaper metal, such as Fe or Al, in a bed of metal particles. The ions of the cheaper metal exchange with the heavy metal, which deposit on the particles. Effluents which may be treated by this method are those containing chromium, cyanides, nitrates, and lead. The deposits are released by abrasion between particles produced by air fluidization in the presence of sand. When the elecropositive is aluminum or zinc, the surface is activated by acids or bases. When the electropositive metal is iron, an oxidizer may be added. The reaction zone contains an anode and a cathode at a potential difference. The heavy metals are precipitated as easily recoverable deposits on the electropositive metal. (Sandoski-FIRL)
W76-02790

THE DEPENDENCE OF THE COMPLETENESS OF NONFERROUS HEAVY METAL SEDIMENTATION FROM WASTE WATERS ON THE PROPERTIES OF THE FILTRATING FABRIC (ZAVISIMOST' POLNOTY OSAZHENIYA TVAZHELYKH TSVETNYKH METALLOV IZ STOCHNYKH VOD OT SVOYSTV FIL'TROVAL'NOY TKANI),
For primary bibliographic entry see Field 5A.
W76-02791

MERCURY RECOVERY.
French Patent FR 2162026. Issued July 13, 1973. Derwent French Patents Abstracts, Vol U, No 39, p M3, July, 1973.

Descriptors: *Polymers, *Patents, *Mercury, *Recycling, *Waste water treatment, Industrial wastes, Electrolysis.

In this patented process, mercury is eliminated from waste water obtained from the electrolysis of alkali metal chlorides, containing Hg salts. The solution is contacted with a homo- or copolymer of acrylothioamide. Mercury is recovered for reuse. The ratio of nitrile to thioamideor thiolimine groups is between 12 and 0.6. This copolymer is a polyacrylothioamide/divinylbenz
ene/acetylstyrene/styrene copolymer or polyacrylothioamide/methyl methacrylate copolymer. The copolymer has a sulfur content greater than 15 mole percent. The polymer is used in the expanded state or in the form of fibers. (Sandoski-FIRL)
W76-02792

WASTE CONTROL FOR JOB PLATERS,
F. Pollard.
Industrial Finishing, Vol 49, No 11, p 67-68, November, 1973. 1 tab.

Descriptors: *Copper, *Nickel, *Chromium, *Industrial wastes, *Waste water treatment, *Chemical precipitation, Metals, Capital costs, Equipment, Sewage treatment, Filtration.
Identifiers: Job shops, Plating wastes, Cyanide.

In the Detroit, Michigan, area, recent innovations have been made for the control of plating wastes including copper, nickel, chromium, and cyanide in the job shop. The individual plater may meet his effluent requirements with negligible capital costs, using low-cost equipment and chemicals. Hexavelent chromium is reduced to the trivalent state with ferrous sulfate obtained free from steel piclers. Treatment is achieved by running water into a 55-gal drum of ferrous sulfate with a hole in its bottom and a screen six inches above the hole. Dissolved ferrous sulfate is carried to the rinse stream. Cyanide may be destroyed by the trickling of sodium hypochlorite into the stream of rinse water from copper baths. About five gallons of the commercial 16.5% solution is required per pound of cyanide, and copper is precipitated. Nickel may also be precipitated out of the rinse water by comgining electrocleaner rinse water with the rinse stream from the nickel tanks. The alkalinity from the electrocleaner raises the pH well above 8.0 at which point the nickel leaves the solution as hydroxice. The precipitated metals are removed by settling and filtration at the Detroit Sewage Plant. (Sandoski-FIRL)
W76-02793

XANATHATE REMOVAL FROM WASTE WATER,
I. I. Shabunin.
Soviet Patent SU 361147. Issued February 6, 1973. Soviet Inventions Illustrated, Vol U, No 38, p D9, February, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Irradiation, Metals, Metallurgy, *Patents.
Identifiers: *Xanthate removal, Non-ferrous metals.

A method has been patented for xanthate removal from waste water, which may be used in non-ferrous metallurgy. Waste water is irradiated with light of the wavelength 2500-5500 angstroms to decompose the xanthates. In this example, waste water containing 6.4 mg/liter butyl xanthate at a pH of 7 was irradiated with light over the full spectrum while flowing at a water depth of 15 mm and a speed of one cm/sec under an intensity of 0.8 volt/sq cm. This lowered the xanthate concentration to 0.1 mg/liter over 25 minutes. (Sandoski-FIRL)
W76-02794

COAGULANT AID CLEARS THE WATER FOR A WIRE MANUFACTURER.
Industrial Wastes, Vol 19, No 5, p 31, September/October, 1973.

Descriptors: *Coagulation, *Waste water treatment, *Industrial wastes.
Identifiers: Coagulant aids.

Southwire Company of Carrollton, Georgia, has purchased a design and treatability system to remove oil and copper from their waste water. This wire manufacturer also made major revisions in its inplant piping to separate the contaminated water from clean water which was used for cooling. To treat oil effluent which was not hauled away by tankers, a coagulant aid called Claracel was utilized. Claracel reduced the alum dosage requirement from 12,000 to 4000 mg/liter, and the lime dosage from 8000 tp 2500-3000 mg/liter. The treatment plant began fulltime operation in April, 1972. Tests indicated that the combination of alum, lime, and Mogul Claracel works well. Oil concentration levels were about 10% or less, requiring only 1000 mg/liter of alum, 750 mg/liter of lime, and 25 mg/liter of claracel. Operating costs were about $7 a batch for the alum, $3 for the lime, and $3 for the coagulant. (Sandoski-FIRL)
W76-02795

PURIFICATION OF INDUSTRIAL WASTE WATER CONTAINING OIL, FAT AND SOLVENTS WITH IMPROVED SEPARATING AGENTS (REINIGUNG VON OEL, FETTUND LOESUNGSMITTELHALTIGNE INDUSTRIEABWAESSERN MIT VERBESSERTEN TRENNMITTELN).
W. Schmity.
Chemische Industrie, Vol 25, No 8, p 499-501, 1973. 5 fig.

Descriptors: *Waste water treatment, *Separation techniques, *Oil wastes, Industrial wastes, Adsorption, Centrifugation, Filtration, Oily water, Waste water disposal.
Identifiers: Hydrophobic silicic acid.

Standards in West Germany require that the oil content in industrial effluents must be reduced to a petrol ether extractable residue of 10-20 mg/liter before discharge to sewers. The stable oil-in-water emulsions cannot be broken up by mechanical processing. Products of the Degussa Works two separating agents, B-20 and B-22, have been used with good results for the breaking up of these emulsions. Both are powders which contain as the principal component a highly dispersed hydrophobic silicic acid which because of its oleophilic properties adsorbs several times its own weight of oil. Both preparations worked satisfactorily with effluents containing 0.5 and 1.0% oil rendered highly stable by a high concentration of surfactants. In addition to the oil, metal hydroxides are adsorbed and thus an overall excellent purification effect is achieved. B-22 is added to the effluent in amounts of one to 2 kg/cu m washing water emulsion. The one-step breakup and adsorption process take

several minutes of mechanical mixing in a tank at rotation speeds of 1000 rpm's and flakes of silicic acid with the adsorbed oil are removed by filtration or centrifugation; the oil cake is incinerated leavine Si02, or dumped under controlled conditions. (Takacs-FIRL)
W76-02796

INDUSTRIAL WASTE WATER TREATMENT PLANT.
French Patent FR 2162580. Issued July 20, 1973. Derwent French Patents Abstracts, Vol U, No 40, p D3, July, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Oil, Coagulation, Treatment facilities, Costs, Separation techniques, Tanks.

An industrial waste water treatment plant with concentric tanks has been designed for removal of contamination, in suspension or emulsion, by oil. In this patented system waste is fed, together with a coagulant and alkali, into the base central part of an inner coagulation tank. The resultant flakes of hydroxide are formed, bonding the contamination. The resultant scum is extracted into an annular trough in the inner wall of the tank, then into a concentric flotation separation tank around the inner tank. The plant is compact and relatively inexpensive.
W76-02797

HOW A CHEMICAL PLANT BEATS POLLUTION.
Canadian Controls and Instrumentation, Vol 12, No 9, p 66-67, September, 1973.

Descriptors: *Industrial wastes, *Waste water treatment, *Chemical wastes, *Dentrification, Monitoring, Remote sensing, Operating costs, Pollutant identification, Biochemical oxygen demand, Treatment facilities.

A new denitrification plant has been installed at Du Pont's Maitland chemical and fibers manufacturing plant and is equipped with an extensive remote pollution monitoring network. This network consists of on-stream oxygen meters, pH meters, and other analyzers to alert operators in a central control room as soon as any of the monitored parameters of the effluent rise above acceptable levels. The denitrification plant is a modified activated sludge process, and will treat 2.5 mgd of process effluent. It will remove 53,000 pounds of BOD daily, and 8000 pounds of nitrogenous materials. Organic carbon content of the effluent will be reduced by 80 to 90% and the nitrogenous content by about 60 to 70%, which is considered a good level of efficiency at relatively low capital and operating costs. Scrubbers have been installed on the vents from the polymer process to condense all the steam and diamine, ensuring that the possibility of odors is eliminated. Continuously recording smoke detectors are used to keep a check on potential air pollutants. Frequent noise measurements are also made within and around the plants to ensure that noise is limited to tolerable levels both for the in-plant work force and for nearby residents. (Sandoski-FIRL)
W76-02798

PLANT FOR INDUSTRIAL WATER POLLUTION CONTROL, (IN JAPANESE),
H. Yamazaki.
Technical Report of Ishikawajima Harima, p 94-103, May 1973. 10 fig, 11 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Treatment facilities, Activated sludge, Separation techniques, Equipment, Coagulation, Oily water.
Identifiers: Multi-waveplate separator, Japan.

The IHI-PASSAVANT coagulator, IHI-PASSAVANT activated sludge treatment apparatus, and the IHI-PASSAVENT multi-waveplate separator have been developed in Japan. The coagulator is a vertical-flow, compound,type, sedimentation apparatus which has the characteristics of high separation efficiency, wide application to a large variety of wastes, possible ejections of sludge and suspended matter, easy maintenance, and low cost. The activated sludge treatment apparatus is the circulation flow type in which the incoming waste water is diluted with a large quantity of water constantly circulating in the basin. This apparatus has wide application to treatment of waste water with different qualities with minimal sludge accumulation. The multi-waveplate separator is used in oil-water treatment. The particle size of the oil to be separated becomes a function of the distance between plates and the plate length. (Seigle-FIRL)
W76-02799

TRAILER-MOUNTED PILOT PLANTS FOR WATER CONSERVATION,
Gulf Research and Development Co., Pittsburgh, Pa.
E. M. Sutphin.
Chemical Engineering Progress, Vol 69, No 8, p 79-80, August, 1973. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Pilot plants, Oil industry, Chemical wastes, Treatment facilities, *Water conservation, Design criteria, Engineering.
Identifiers: Refinery wastes.

A forty-foot trailer, housing 18 individual water treating pilot plant modules, has been designed for use in aiding the development of individual treatment systems for chemical plants and refineries. The system provides engineering data on selected water treating processes utilizing the stream to be improved, permits an efficiency evaluation, or the selection and design of the most desirable water treatment system for a particular installation. When used at a refinery or chemical plant site, the trailer allows the plant personnel to actually observe the operation, to change the operation or process flow in any way seen fit, and to evaluate the capability and characteristics of different systems. (Sandoski-FIRL)
W76-02800

LARGEST TREATMENT PLANT FOR METAL FINISHING WASTES.
Industrial Finishing, Vol 49, No 9, p 36-40, September, 1973. 6 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Treatment facilities, Neutralization, Filtration, Oily water, Separation techniques, Sludge treatment.
Identifiers: *Metal finishing wastes.

A two mgd metal finishing waste treatment plant has been constructed by General Electric at Appliance Park East, Columbia, Maryland. In the waste treatment plant, operating since the summer of 1971, acid-alkali wastes flow through a flow meter-equipped pipeline to a trash removing bar screen; through two pH controls to an acid mixing tank; into an API separator; and, to an acid-alkali holding basin for storage. Chromium wastes then flow into a flume and through a trash removing bar screen into a 90,000-gal chromium holding basin. Neutralization occurs when the combined streams flow through a flow meter into a chemical mixing chamber where the pH is adjusted by the addition of lime for optimum dissolved metals precipitation. Powdered activated carbon removes color and organic traces while coagulants and coagulant aids are added to promote clarification in a reactivator clarifier. The clarifier uses internal sludge recirculation in rapid-flow to remove precipitated materials. Clarified effluent flows through a Mono-Pak filter to remove all turbidity. The filtered water is finished by the addition of two ppm dissolved oxygen provided by cascade-type aerators. Clarifier sludge is discharged into a sludge pit, enters a 75 gpm Rota Rake sludge thickener, and then travels to a dewatering centrifuge. Liquid from the thickener and centrifuge is returned to the acid-alkali holding basin for retreatment along with filter backwash water. (Sandoski-FIRL)
W76-02801

CHRYSLER ANNOUNCES PROGRESS WITH IRON-CHIP WATER PURIFICATION METHOD.
Industrial Heating, Vol 40, No 7, p 1260, July, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, Iron, Water reuse, Oily water, Dissolved solids, Capital costs, Laboratory tests, Phosphates.
Identifiers: Chromium, *Iron chips, Rotating drum.

Recently conducted experiments have shown that waste water treatment using iron chips holds promise for total water reuse not possible with present technology. The iron chips react with water contaminants to form insoluble products which can be removed by settling and/or filtration. Following initial laboratory work with the iron chips, a pilot plant was established in an engine facility to treat oily waste water. After several days of flowing water from one iron chip-filled cell to another, the chips became coated with oil, reducing the effectiveness of the treatment. The chip-filled cells were then tested as batch processing units. Air was bubbled through the cells filled with waste water, and the water was then drained off. A reduction in dissolved solids was effected but requirements for air made capital costs for this process almost 50% higher than chemical treatment methods. Laboratory studies were conducted to determine if the iron chip process could be used to remove high levels of chromium and phosphate in waste water. A pilot line was established making use of a rotating drum to provide chip movement. However, mechanical difficulties have delayed a complete analysis of this method. (Sandoski-FIRL)
W76-02802

SOME ASPECTS OF A CHEMICAL TREATMENT OF THE WASTE WATERS FROM THE BEAMHOUSE,
Institut INO voor Leder en Schoenen, Waalwijk (Netherlands).
A. J. J. Van Meer.
Journal of the American Leather Chemists, Vol 48, No 8, p 339-345, August, 1973. 7 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Tannery wastes, Organic pollutants, Sludge.
Identifiers: Beamhouse effluents, Acidification.

The reduction of the waste loads from tannery effluents by acidification of the residual beamhouse liquors has been investigated. Findings indicate that the total organic waste load of a chrome leather tannery was reduced about 58% when soaking and unhairing operations were combined. The protein precipitate from combined operations was more amenable to treatment than the normal sludge from tannery effluents. Only about 300-500 gallons per thousand pounds of hides, green weight, had to be treated as compared with much larger amounts for conventional soaking and unhairing procedures. Additional tanning experiments must be performed to prove that this procedure is consistent with a good leather quality. (Sandoski-FIRL)
W76-02803

WAYS TO AN ECONOMIC WATER USE DEMONSTRATED BY THE EXAMPLE OF A

SMALL COTTON DYEING PLANT (WEGE ZUR WIRTSCHAFTLICHEN WASSERVEREWENDUNG AM BIESPIEL EINER KLEINEN BAUMOLLFAERBEREI),
J. Fr. Grugler, and F-R. Preuss.
Wasserwirtschaft-Wassertechnik, Vol 23, No. 7, p 241-244, 1973. 6 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Water reuse, Dyes, Chemical precipitation, Sludge treatment, Landfills, Treatment facilities.
Identifiers: Filter presses, Ferrous sulfate.

Water recycling and waste water treatment adopted at a small-capacity cotton dyeing plant in East Germany, with a view to increasing water shortage and plant expansion, has resulted in the introduction of an adequate pH measurement method and waste water treatment by precipitation with ferrous sulfate for recycling in the flushing process. The hot water used for rapid driers also can be utilized in the high-temperature equipment if it is softened. Boiler vapor condensates are recycled. The sludge from this continuously or intermittently operating waste water treatment plant amounts to 15-18 percent of the total effluent volume and is subjected to gravitational thickening for 20 hours in a thickening tank. Further dehydration prior to disposal on a sanitary landfill is done by means of a chamber filter press. (Takacs-FIRL)
W76-02804

OXYGEN PULP BLEACHING CUTS WASTE EFFLUENTS,
Kaymer, Inc., Glens Falls, N.Y.
G. Rowlandson.
Chemical Engineering, Vol 80, No 20, p 78-79, September 3, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Water reuse, Recycling, Operating costs, Capital costs, Evaporation, Color, *Pulp wastes.
Identifiers: Oxygen bleaching.

A pulp oxygen bleaching unit that will completely recycle its own effluent to the kraft recovery cycle has a bleaching capacity that matches the capacity of the kraft pulping unit it serves. The new plant is owned and operated by La Cellulose d'Aquitaine, located at St. Gaudens, France. The installation of this type of oxygen bleaching unit provides the most economical solution, in terms of operating and capital costs, compared to lime decolorization. Total investment (on an installed basis) for the complete system, including all associated revisions within the pulpmill, was $4.56 million. The pulpmill changes mainly affected multiple-effect evaporators in the black-liquor recovery circuit to eliminate existing sealing problems and to increase capacity by 10 percent. A reduction of 75 percent of the color quantity and 50-70 percent of the chlorides in the combined bleach plant effluent was accomplished. There is no need for a chloride removal system. The equivalent of about 80 pounds of salt cake per ton of pulp is reclaimed. (Sandoski-FIRL)
W76-02805

LIQUID REMOVING METHOD,
R. R. Candor, and J. T. Candor.
United States Patent 3,757,426. Issued September 11, 1973. Official Gazette of the United States Patent Office, Vol 914, No 2, September, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Separation techniques, Electrodes, *Patents, Pulp wastes.
Identifiers: Electrostatic means, Paper slurry.

A patent has been issued for a process to remove liquid from the paper slurry of a paper making apparatus. The liquid in the paper slurry is removed by an electrostatic means that provides a differential in the potential of the moisture in the paper slurry and an electrode means which causes the moisture in the paper slurry to move toward the electrode means. The electrode means may include a suction nozzle which tends to draw a large volume of air through the paper slurry and to direct the moisture from the paper slurry toward the electrode means. (Sandoski-FIRL)
W76-02806

MODERN DRYING TECHNIQUES IN THE PAPER AND PULP INDUSTRY (MODERN TORKTEKNIK INOM PAPPERS-OCH CELLULOSAINDUSTRI),
K-E. Lindberg, and B. Kaltin.
Modern Kemi, No 6, p 22-27, 1973.

Descriptors: *Drying, *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, Evaporation, Incineration, Ion exchange, Chemical oxygen demand, Biochemical oxygen demand, Lignins.
Identifiers: Oxygen bleaching, Uddeholm method, Tampella recovery method.

New pulp drying methods, oxygen bleaching of pulp in an alkaline medium, the Uddeholm process for the treatment of bleaching-generated effluents, and a process applied to black liquor incineration and chemical recovery in a sulfite plup mill, are described. The black liquor from the oxygen bleaching process is similar to that generated by the sulfate process, and thus both types of black liquors can be combined for evaporation, incineration, and the recovery of chemicals. A 300 ton/day capacity ion exchange unit adopting the Uddeholm method has been used successfully for several months for the treatment of effluents from the first alkaline bleaching stage. The dye concentration, as well as the COD and BOD values of the effluent, are reduced by the ion exchanger by more than 90 percent, 70 percent, and 30 percent, respectively. Nearly quantitative removal of lignin and chlorides is achieved by the Uddeholm Color Removal Process. In a large-capacity sulfite pulp mill in Valkaekoski, Finland, cooking has been converted from a calcium to a sodium disulfite process, which evaporates and incinerates part of the black liquor together with the sulfate pulp black liquor. According to the Tampella recovery method, sulfur is separated from the incinerator soda lye in the form of hydrogen sulfide with soda remaining as a residue. The generated hydrogen sulfide is burned to obtain sulfur dioxide. (Takacs-FIRL)
W76-02807

TREATMENT OF EFFLUENT IN POULTRY PROCESSING.
FMF Review, p 24, July, 1973. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Poultry, Biological treatment, Plastics, Filters, Food processing industry, Dairy industry.
Identifiers: Biofilters, Flocor.

At the poultry processing factory of J. P. Wood and Sons Limited, Craven Arms, England, it has been the practice to dispose of the effluent by spraying it over a large area of unused land which resulted in its progressive saturation. Authorities agreed that this method was no longer acceptable and that some form of biological treatment would be necessary. The full biological treatment plant constructed comprised screening, fat trapping, and roughing treatment over a two-pass unit in-loop settlement followed by polishing by a single-pass conventional percolating filter. The design for a treatment plant at the Express Dairy, Tarrin, Chester, incorporated a new fat trap and additional balancing facilities, followed by bio-towers utilizing 'Flocor' plastics filter as the bio-medium, with in-loop settlement, and finished by polishing over conventional percolating filters operated as ADF. The resultant effluent was lower than the Royal Commission 20/30 standard. (Sandoski-FIRL)
W76-02808

MICROBIAL TREATMENT OF INDUSTRIAL WASTES: TREATMENT OF FODDER YEAST WASTE.
Taiwan Sugar Experiment Station, Annual Report, p 33-34, 1971-1972. 1 fig, 3 tab.

Descriptors: *Biological treatment, *Waste water treatment, *Industrial wastes, Waste disposal, Anaerobic digestion, Yeast, Chemical oxygen demand, Biochemical oxygen demand, Aerobic conditions, Methane, Activated sludge.
Identifiers: Fodder yeast wastes.

The disposal of waste from the Fodder Yeast Factory of the Taiwan Sugar Company creates a problem because of the large quantity, high BOD and COD concentrations, and deep brown staining. Anaerobic (methane fermentation) and aerobic treatments (activated sludge process) were applied to reduce the BOD value of the waste. A12(SO4)3 and FeC13 were used to decolorize the digested fluid. In the case of anaerobic treatment, an effective treatment could be obtained by increasing the sludge concentration from 5 to 20 volume-percent. In the aerobic tests, the yeast waste fluid was first diluted with water and then treated by activated sludge in shaking flasks. The optimum conditions for removing BOD and COD at 30 C were an aeration rate of 5.5 x 10 to the minus 7th power in Kd value by sodium sulfite method, a pH value of 7.0, and a six percent sludge concentration after centrifugation at 3,000 rpm for five minutes. It was found that the transmittance of the diluted digestive fluid at 440 mu could be increased from 11 to 69 percent when 2,000 mg A12(SO4)3 was added to 1,000 ml of the diluted fluid. For FeC13, the transmittance reached 86 percent when 1,500 mg was added to the diluted fluid. (Sandoski-FIRL)
W76-02809

METHOD FOR DETERMINATION OF ACRYLONITRILE AND ACETONITRILE IN WASTE WATERS (METODA PENTRU DETERMINAREA ACRILONITRILULUI SI ACETONITRILULUI IN APEL REZIDUALE),
For primary bibliographic entry see Field 5A.
W76-02810

TREATMENT OF INDUSTRIAL WASTE SOLUTIONS AND PRODUCTION OF USEFUL BY-PRODUCTS USING A PHOTOSYNTHETIC BACTERIAL METHOD,
Kyoto Univ., (Japan). Dept. of Agricultural Chemistry.
M. Kobayashi, and Y. T. Tchan.
Water Research, Vol 7, No 8, p 1219-1224, August, 1973. 1 fig, 5 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Bacteria, Algae, Microbial degradation, Chlorophyta, Recycling, Waste disposal, Fertilizers, Foods, Fish diets, Poultry, Agriculture.
Identifiers: *Photosynthetic bacteria method.

The purification of some industrial waste water by photosynthetic microbes has been studied. The by-products of the treatment, photosynthetic bacteria and green algae, were used as food for animals and fish, and as a fertilizer. The survival rate of carp fry was significantly higher in the group fed with photosynthetic bacteria (PSB). The effect of PSB on egg laying is commercially important. In six months, the treated group of birds produced 3708 more eggs than the control group. The use of PSB cells as a fertilizer for mandarin production showed an increase in the number of fruit per tree, and the average fruit was heavier, sweeter (increased in sugar content), and more attractive in appearance (increased in carotenoid pigments). The total increase in yield of fruit was 1152 kg. The results from these experiments indicate that the by-products from this process are valuable, per-

mitting the recycling of waste products into food production. The elimination of sludge in this treatment is also important, especially in areas where disposal of sludge is difficult. The by-products from this treatment are easily transportable since PSB and algal cells can both be dried and packed for shipment. This allows the use of these products in distant rural areas away from the production centers. (Sandoski-FIRL)
W76-02811

FILTER HAVING A FLEXIBLE WALL FOR FILTERING LIQUIDS,
E. Fournier.
Australian Patent 44,975. Applied June 18, 1970. Issued February 7, 1974. Official Journal of Patents, Trade Marks, and Designs, Vol 44, No 4, p 385, February 7, 1974.

Descriptors: *Patents, *Filter, *Flexibility, *Liquid wastes, Separation techniques, Equipment, Operation, *Waste water treatment.
Identifiers: Suction.

A filter with a flexible wall for filtering liquids is described. It consists of two discs, one of which is connected to a support and which has a fluid outlet aperature connected as a means of suction. The second disc member is coaxial with an axially movable relative to the first disc member. A flexible filter sleeve extends between the two discs and is connected to them. There is a gravity activated ballast means which biases the discs away from each other and tenses the flexible filter sleeve to approximately cylindrical form when no suction is applied. The discs flex inwardly when the apparatus is immersed in a fluid-containing solids. The solids are deposited on the filer filter when suction is applied. (Merritt-FIRL)
W76-02813

EFFLUENT SLUDGE TREATMENT.
Netherlands Patent 7,304,173. Applied March 26, 1973. Issued February 14, 1974. Derwent Netherlands Patents Report, Vol 5, No 9, p 2, April, 1974.

Descriptors: *Patents, *Sludge treatment, Chemical precipitation, Effluents, Proteins, Acidity, *Waste water treatment.
Identifiers: *Wet scrubbers, *Combustion gases, Sulfur dioxide, Sulfur trioxide, Hydrogen chloride, Hydrogen fluoride.

Effluent sludge is treated by passing it through a scrubber or other wet washing process which increases the surface area by contacting it with combustion gases at 600-800 C. The gases are made by trioxide, hydrogen chloride and small amounts of hydrogen fluoride, so that the effluent is acidified and proteinaceous material is precipitated. The temperature is preferably less than 50 C during the treatment. The process allows treatment of effluent sludges containing about 99 wt % of water without using conventional precipitating agents. (Merritt-FIRL)
W76-02814

ION EXCHANGER PURIFICATION PLANT.
French Patent 2,186,289. Applied June 1, 1973. Issued February 15, 1974. French Patents Abstracts, Vol 5, No 10, p 2, April 1974.

Descriptors: *Patents, *Sewage treatment, *Ion exchange, *Waste water treatment, Cellulose, Organic wastes, Mixing.

An ion exchanger purification plant is described in which the liquid to be purified is mixed thoroughly by a variety of mechanical methods. The mixing occurs in treatment tanks in series and/or parallel with granulated activated regenerated cellulose or cellulose derived material. The ion exchanger process extracts the unwanted impurities from the liquid which is then separated again by a variety of methods from the ion exchanger material. A part at least of those impurities are then stripped out of the exchanger material by regeneration expecially using the same activator as that used initially and the regenerated ion exchanger wholly or partially fed back into the plant for reuse after being flushed through. The plant is especially useful for removal of animal and vegetable matter from sewage. (Merritt-FIRL)
W76-02815

MULTIPLE RE-USE OF WATER,
W. H. Champman, and J. F. Eichelmann.
Canadian Patent 944, 875. Applied March 8, 1971. Issued April 2, 1974. Patents/Brevets, Vol 102, No 14, p 1224, April 2, 1974.

Descriptors: *Patents, *Waste water treatment, *Demineralization, *Water reuse, Mineralogy, Saline water, Water purification, Brackish water, Water pollution control, Waste water disposal, Effluents, Industrial water, Potable Water, Irrigation, Municipal water, Water supply, Water supply resources, Evaporation, Canada.

A process for the treatment of saline, brackish or other high mineral content water to provide effluent waters for domestic and industrial usage and for the treatment of the domestic and industrial waste water for multiple reuse so as to solve both water supply and waste water pollution problems is described. A demineralization system is combined with a system utilizing a relatively nonvolatile fluidizing liquid and capable of operating on a waste waters of relatively high solids content. The latter system receives high mineral content effluent from the demineralizer as well as waste water from the industrial and/or domestic sources. Potable water and low mineral content waters for industrial use are produced and substantially all water is reused except that lost by evaporation to the atmosphere or by use in irrigation. The system is particularly well adapted for small communities having an adjacent industrial plant. (Merritt-FIRL)
W76-02816

PREPARATION OF ION EXCHANGE RESINS BASED ON AGAROSE.
German patent 1,916,107. Applied March 28, 1969. Issued February 28, 1974. German Patents Abstracts, Vol 5, No 10, p 1, April, 1974.

Descriptors: *Ion exchange, *Resins, Proteins, Viruses, Enzymes, *Waste water treatment.
Identifiers: *Agarose, Nucleic acids, Nucleotides, Nucleoprotides.

Basic ion exchange resins are prepared from agarose or cross linked glyceryl agaroses by treatment with equimolar amounts of epichlorhydrin and triethanol-amine in a basic medium for 30 min at 75-80 C. The products are useful for the isolation and purification of viruses, proteins, nucleic acids, nucleotides, nucleoprotides, and enzymes. (Merritt-FIRL)
W76-02817

ACTIVATED SLUDGE TREATMENT IN TANK AERATOR.
Belgium Patent 806,582. Applied October 26, 1973. Issued February 15, 1974. Derwent Belgium Patents Report, Vol 5, No. 10, p 2, April, 1974.

Descriptors: *Sludge treatment, *Patents, Activated sludge, Pump, Nozzle, Sewage, Oxygenation, Agricultural wastes, Venturis, *Waste water treatment.
Identifiers: *Aerator.

An activated sludge treatment tank aerator is described which used multiple jet pumps driven by a common rotary pump. Either an external electric motor driven impeller pump with suction side connected to the lower part of the circular treatment tank, or an immersed pump may be used. From the delivery side of that pump either a curved horizontal pipe or the body of the main immersed pump, feeds a number of radially spaced nozzles in the form of Venturis, so that turbulence is created in the tank contents. Each Venturi has a vertical air inlet pipe at its throat leading to above the maximum liquid level especially above the tank roof. Thorough mixing of activated sludge with the sewage especially farmyard, combines with oxygenation. (Merritt-FIRL)
W76-02819

ACTIVATED SLUDGE WASTE WATER PURIFIER.
Belgian Patent 806,205. Applied October 17, 1973. Issued February 15, 1974. Derwent Belgian Report, Vol 5, No 9, p 2, April, 1974.

Descriptors: *Patents, *Waste water treatment, *Water purification, Equipment, *Activated sludge, Sludge treatment, Domestic wastes, Industrial wastes, Effluents, Aeration, Underground structures.

An activated sludge waste water purifier is described which combines blower aeration and stabilizing vessels in a single underground tank. Domestic or industrial waste water is treated in order that it may be discharged as an effluent without pollution hazard into a cylindrical underground tank. The tank is divided into an aerating section and a stabilizing section and separated by a partition penetrated by a pipe leading to the liquid surface. The installation preferably has a manhole, covered by a metal grid which provides access to the blower and both sections of the tank. Water is fed to one end of the tank in aeration section, and pure water is recovered via perforated surface collection pipes. The unit may be installed close to residences, is not noisy, and is not susceptible to contamination with vegetation. (Merritt-FIRL)
W76-02820

CISTERN.
For primary bibliographic entry see Field 8C.
W76-02821

AEROBIC DRYING OF ORGANIC WASTE,
H. Gujer.
Australian Patent 445,094, Applied December 2, 1968, Issued February, 1974. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 5, p 460-461, February, 1974.

Descriptors: *Waste water treatment, *Patents, *Aerobic conditions, *Dewatering, *Organic wastes, Water drying.

An aerobic method for continuously dewatering organic waste matter of a water content of more than 40% by weight is described. Aerobic precomposting proceeds to a water content permitting aerobic compositing of the water waste matter while simultaneously precomposting the waste matter arranged in a bed of substantially uniform thickness. The waste matter with more than 40% by weight water is periodically admixed through proportionately progressive addition to the total bed mass which consists essentially of precomposted waste matter of the same type, in a maximum quantity of 20% by weight of the bed mass per day. The entire bed mass is circulated several times daily during the continuous precomposting process and as much precomposted, dewatered waste matter is removed from the process as new waste matter of a water content of more than 40% by weight is added. (Merritt-FIRL)
W76-02822

EFFLUENTS BIOCHEMICAL PURIFICATION,
D. N. Smirnov, A. S. Dmitriev, and R. T. Gumbatov.

Soviet Patent 385,929, Applied February 18, 1971, Issued September 20, 1973. Soviet Inventions Illustrated, Vol 5, No 9, p 2-3, April, 1974. 1 fig.

Descriptors: *Patent, *Waste water treatment, *Maintenance, Activated sludge, Monitoring, Drainage water, Aeration, Water level, Automatic control, Tanks, Valves.

The maintenance of a stable purification process is controlled by continuous monitoring of oxidation regeneration potential of drainage water flowing into aeration tanks and recirculation of sludge and supply of air into the tank automatically adjusted in accordance with test results. The concentration of contaminated drainage water is checked by test unit which is used to control the air flow through a valve. The test unit is also used to control the water level in the sedimentation tank. Sludge in the tank is recirculated through a regulated valve to the tank. (Merritt-FIRL)
W76-02823

PURIFYING POLLUTED EFFLUENT,
V. Stengelin.
Netherlands Patent 7,310,800, Applied August 3, 1973, Issued February 7, 1974. Derwent Netherlands Patents Report, Vol 5, No 8, p 3, March, 1974.

Descriptors: *Patents, *Separation technique, *Waste water treatment, Effluent, Water pollution treatment.

A separation technique for purifying polluted effluent is described. The incoming effluent is split into two fractions of which the major, about 80-95% of the whole, is put into the first stage while the balance of untreated effluent is divided between the second and subsequent stages. This increases the decomposition rate in later stages. (Merritt-FIRL)
W76-02825

LOW-TEMPERATURE PURIFICATION OF FLUIDS,
G. E. Hays, and M. A. Albright.
Canadian Patent 943,055, Applied May 10, 1971, Issued March 5, 1974. Patents/Brevets, Vol 102, No 10, p 839, March, 1974.

Descriptors: *Waste water treatment, *Patents, *Absorption, Liquids, Gases, Streams, Temperature.

An absorption process for the low temperature purification of fluids is described. Liquids or gas streams are purified at a temperature at or below the freezing point of the constituents to be purified. Operating at or below that temperature greatly increases the adsorption capacity of the adsorptive material. (Merritt-FIRL)
W76-02827

FILTERING PROCESS,
J. Goldfield, and V. Greco.
Canadian Patent 943,079, Applied March 16, 1971, Issued March 5, 1974. Patents/Brevets, Vol 102, No 10, p 844, March, 1974.

Descriptors: *Waste water treatment, *Patents, *Filtration, *Filters, Liquids, Solid wastes, Gases, Pressure.
Identifiers: Submicron particles.

A process for filtration of submicron liquid and solid particles from large volumes of gas in which the particles are carried is described. The gas is passed through a filter medium made up in fibers having an average diameter of up to about 10 micron at a velocity of at least 300 ft/min and at a pressure drop not greater than 40 inches of water to remove at least 80% of such particles. (Merritt-FIRL)
W76-02828

WATER PURIFICATION.
For primary bibliographic entry see Field 5F.
W76-02829

LIQUID WASTES TREATMENT METHOD,
J. O. H. Cessna.
Canadian Patent 945,695, Applied September 16, 1971, Issued April 16, 1974. Patents/Brevets, Vol 102, No 6, p 1404-1405, April, 1974.

Descriptors: *Patents, *Liquid wastes, *Clarification, *Waste water treatment, *Aeration, *Recycling, Flow, Filters, Sludge, Activated sludge, Solids, Biological treatment, Suspended solids, Effluents, Secondary treatment, Primary treatment, Mixing, Canada.

A two stage high-rate, activated biological filter system is used, involving a primary clarifier for treatment of liquid wastes. Activated floc and biological slime are sloughed off from the biological filter and returned to a primary clarifier. The activated floc is built up in the biological filter by the recycling of substantial quantities of aerobic sludge from a secondary clarifier to the biological filter and by the metering of solids wasted from the treatment system. This maintains the mixed liquor, suspended solids level in the filter effluent in excess of about 1500 mg/liter. Underdrain flow from the secondary clarifier is a substantial percentage of plant influent flow. This is recycled without extended mixing with plant influent or aeration prior to distribution over the biological filter. (Prague-FIRL)
W76-02832

CARBON-CONTAINING WASTE WET-OXIDATION.
Netherlands Patent 7312-989, Applied September 20, 1973, Issued April 2, 1974. Derwent Netherlands Patents Report, Vol 5, No 16, p 1, May, 1974.

Descriptors: *Patents, *Municipal wastes, *Carbon, *Oxidation, Gas, Ecological effects, Effluents, Sewage, Dispersion, *Waste water treatment.
Identifiers: *Carbon-containing wastes, *Wet-oxidation.

A horizontal reactor is subdivided into several cylindrical, interconnected compartments for the wet-oxidation of carbon-containing waste material. This process involves contacting an aqueous dispersion of the waste material within an oxidizing gas. The dispersion is introduced continuously into one end of the minutes, dispersion is kept at acid pH (2-7) and 204 C to 246 C. Rapid oxidation of the carbon-containing waste material is effected by strong stirring, movement, and distribution of the oxidizing gas, and thus forms an ecologically acceptable effluent. This process is suitable for municipal and small-scale sewage processing. (Prague-FIRL)
W76-02833

AERATION PLANT FOR LIQUIDS.
Belgian Patent 807-372, Applied November 16, 1973, Issued March 15, 1974. Derwent Belgian Patents Report, Vol 5, No 14, p 3, March, 1974.

Descriptors: *Patents, *Aeration, *Liquids, *Waste water treatment, *Sewage treatment, Maintenance, Treatment facilities, Air.
Identifiers: *Compressors.

Waste water and sewage are treated by aeration with compressors operating below the liquid surface. The plant has a main air pipe and branch pipes which lead to this aerator, each provided with perforations through which air can escape. At regular intervals the air feed pipes are connected to the main feed and supplied with compressed air by a motor driven machine. This compressor assembly is mounted on slides so that it can be lifted clear of the liquid for maintenance. Since these compressors operate below the liquid surface, no cooling systems are needed and noise is reduced. (Prague-FIRL)
W76-02834

WASTE WATER TREATMENT PLANT.
French Patent 2191-945, Applied July 17, 1972, Issued March 15, 1974. French Patents Abstracts, Vol 5, No 14, p 2, March, 1974.

Descriptors: *Patents, *Waste water treatment, *Treatment facilities, *Flotation, *Aluminum, Sewage, Precipitation, Sludge, Syphoning, Aerobic treatment, Effluents, Design, Separation, Equipment.
Identifiers: Aluminum amalgam, Microbubbles.

Non-biodegradable impurities in effluents are separated by flotation methods using microbubbles of hydrogen produced by the reaction of water with activation aluminum. Impurities are skimmed from the surface while cleared water is extracted by syphoning. The plant design is a single flotation tank with a sump for heavy precipitated sludge. The raw sewage inlet is at about half the height of one side wall with plates of activated aluminum amalgam being placed below the level of the inlet. Overflow runoff for any partly treated effluent can be further treated by aerobic methods. (Prague-FIRL)
W76-02835

FLUIDISED BED REACTOR.
Australian Patent 447,304, Applied January 12, 1970, Issued April 11, 1974. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 13, p 1343, April, 1974.

Descriptors: *Patents, Equipment, *Liquids, Gas, Waste water treatment.
Identifiers: *Fluidised bed reactor.

A fluidised bed reactor comprises a vessel and has a base arranged to support a bed of particulate material within the vessel. This is formed with a multiplicity of perforations for the admission of fluidising gas, conduit means for supplying fluidising gas to the reactor, a first set of tubes of which each tube communicates at one end with the supply conduit means, and a closable valve located between the supply conduit means and the orifice. Openable closure means are located on the side of the orifice, remote from the supply conduit means. The closure means are arranged to permit clearing of the orifice when the closure means is open. A second set of tubes is provided. The number of tubes in each set is equal to the number of perforations and each tube of the second set has a closable valve and communicates at one end with a different one of the tubes of the first set. (Prague-FIRL)
W76-02836

SEWAGE AND INDUSTRIAL WASTE COAGULATION.
Australian Patent 444,072, Applied September 14, 1972, Issued January 1974. Official Journal of Patents, Trade Marks and Designs, Vol 44, No 1, p 34, January, 1974.

Descriptors: *Dewatering, *Sewage, *Industrial wastes, *Patents, Polymers, Floc, Solids, Municipal wastes, *Coagulation, *Waste water treatment.
Identifiers: Water-in-oil emulsions, Latex.

A method of thickening or dewatering solids from municipal sewage or industrial wastes has been patented. It includes the addition of an aqueous solution of a water-soluble vinyl addition polymer, by the inversion of a polymeric latex, to sewage under floc forming conditions. The solids are allowed to settle from sewage to provide a clear aqueous supernate, where polymeric latex is

produced by the steps of forming a water-in-oil emulsion and heating emulsion under free radical forming conditions to polymerize the water-soluble ethylenic unsaturated monomer forming a polymeric latex. (Prague-FIRL)
W76-02837

WATER PURIFICATION COAGULANT PRODUCTION,
L. A. Kulskii, M. I. Dontsova, and M. I. Medvedev.
Soviet Patent 357,808, Applied July 7, 1969, Issued August 31, 1973. Soviet Inventions Illustrated, Vol 5, No 6, p 1, March, 1974.

Descriptors: *Water purification, *Coagulation, Sludge, Inorganic acid, *Patents, *Waste water treatment.

The preparation of an active, hygienic, and economical coagulant to be used in water purification is described. A mineral acid is added to a water purification process sludge until the hydroxide gel is converted to a solution. The sediment is separated from the solution, and the organic matter is oxidized. The point at which the gel becomes a solution is determined by potentiometric or conductivity measurements. The oxidation of organic material is preferably carried out with a powerful oxidizer so that the solution is completely decolorized. In an example, 0.5 liters of mud obtained from a water purification process is treated with 1 liter amounts of 0.1 N HCl after 20 min, and then five times every subsequent hour, then after 13 days, and after 1 mo and 8 days. The degree of peptization is determined from the amount of insoluble sediment resulting. The coagulant obtained is treated with ozone and its technological properties are tested. (Merritt-FIRL)
W76-02839

WASTE WATER PURIFICATION.
French Patent 2,177,843, Applied March 23, 1973, Issued November 9, 1973, French Patents Abstracts, Vol 5, No 1, Feb 7, 1974, p 7.

Descriptors: *Sewage treatment, *Waste water treatment, *Water purification, *Suspended solids, *Nitrogen, Adsorption, Activated carbon, Aerobic conditions, Nitrates, Separation, Techniques, Oxidation, Denitrification, Nitrites, Sedimentation, *Patents.
Identifiers: Methanol.

A method of purification of sewage and other waste water is described which comprises removal of suspended solids and decomposition of nitrogen containing substances. An adsorbent, preferably powdered activated carbon, and an oxygen containing gas are introduced into a reservoir in which the waste water and a growing biomass have been stored for 3 days. Aerobic conditions are maintained until the whole ammonical nitrogen is oxidized to nitrites or nitrates. The solids are separated by sedimentation. The liquid phase is passed into an anaerobic zone to which another portion of the adsorbent and an organic carbon source, preferably methanol, is added. The nitrites and nitrates are reduced to elemental nitrogen and the solids are separated by sedimentation. High rates of denitrification are achieved. (Merritt-FIRL)
W76-02840

TREATMENT OF INDUSTRIAL EFFLUENTS.
Netherlands Patent 7,310,574, Applied July 31, 1973, Issued February 4, 1974. Derwent Netherlands Patents Report, Vol 5, No 7, p 3, March, 1974.

Descriptors: *Nitrogen, *Nitrates, *Nitrites, *Industrial wastes, Effluents, Carbonates, Minerals, Denitrification, Activated sludge, *Waste water treatment, Chemical wastes, Patents.

The treatment of industrial aqueous effluents of pH less than 6.0 containing nitrogenous and carbonated minerals is described. The effluent is entered into an anaerobic zone of treatment containing an anaerobic activated sludge at a rate of flow so that the concentration of nitrate and nitrite ions in the treatment zone are held at low values, less than 3 mg/liter, preferably less than 1 mg/liter. The effluents from the anaerobic zone are pumped to a second treatment zone which may be clarification zone or an aerobic treatment zone. The treatment effluent may be recycled. The process is applicable for the treatment of industrial effluents, particulary from chemical works as from nylon production. The nitrogen content is reduced to a very low figure. (Merritt-FIRL)
W76-02841

AERATOR.
French Patent 2,184,068, Applied May 10, 1973, Issue date not given. French Patents Abstracts, Vol 5, No 7, p 3, March, 1974.

Descriptors: *Activated sludge, *Effluents, *Waste water treatment, Aeration, Equipment, *Patents.
Identifiers: Aerators.

A rotatable, biological surface contact aerator is described for treating activated sludge effluent. It has a series of elements mounted on and spaced along a shaft and is partly emmersed in the effluent to be purified. The elements are a series of discs delimiting both a number of mutually spaced, separate internal coaxial channels opening at each end into a radial channel. Adjacent discs delimit and extra series of separate, coaxial channels also opening at each end into a radial channel. (Merritt-FIRL)
W76-02842

SEWAGE PHOSPHATES EXTRACTION.
French Patent 2,183,605, Applied May 12, 1972, Issued December 21, 1973. French Patents Abstracts, Vol 5, No 7, p 1, March, 1974.

Descriptors: *Waste water treatment, *Sewage treatment, *Phosphates, Activated sludge, Separation techniques, Recycling, Effluents, *Patents.

An extraction method for sewage phosphates is described which uses activated sludge. Raw sewage is passed through a presedimentation tank and then mixed with activated sludge. The resultant slurry is stored in an aeration tank for 1-8 hr where the microorganisms in the activated sludge digest the phosphates being precipitated. The slurry then passes to a sedimentation tank where the phosphated sludge is fed to a stripping tank into which a stoichometric quantity of phosphate stripping and dissolving agents is fed so that the sludge can be recycled. The effluent from the final separator can be passed for subsequent treatment and has significantly reduced BOD. (Merritt-FIRL)
W76-02843

NATURAL FERTILIZER PRODUCTION,
B. P. Kratzer.
Derwent Belgian Patents Report, Vol 5, No 6, p 1, March 14, 1974. Belgian Patent 805,042, Applied September 19, 1973, Issued January 16, 1974.

Descriptors: *Patents, *Fertilizers, *Farm wastes, *Waste water treatment, Hydrogen ion concentration, Separation techniques, Application methods.

The fertilizer is prepared from mixtures of aqueous waste and animal excrement by adjusting the pH of the animal excrement, optimally after mixing with water, to 0.1-2 with mineral acids and agitating the mixture to disintegrate it for 24 to 60 hours separating the liquid phase from the solid material and adjusting the pH of the liquid at least pH 5. Said fertilizer is suitable for domestic gardens, horticultural, and agricultural use. It has no odor, is hygienically acceptable, and is storage stable. (Sandoski-FIRL)
W76-02844

AERATION TANK,
A. S. Dolobovskaya, M. I. Nevzorov, and I. A. Sherenkov.
Soviet Inventions Illustrated, Vol 5, No 5, p 1, March 7, 1974. USSR Patent 381,611, Applied May 22, 1973, Issued August 14, 1973.

Descriptors: *Aeration, Treatment facilities, *Storage tanks, *Waste water treatment, *Filters, Screens, *Sludge treatment, *Patents.

The system consists of a rectangular storage tank fitted with filters, water admission and withdrawal channels, sludge-duct, and screens. The mass-transfer conditions are improved and the purifying process is intensified by creating flows of air and water in opposite directions, the screens in pairs forming diffusers. The sludge mixture is continuously circulated from the bottom of the tank via adjacent corridors along the diffusers upwards and passed into the corridors from above. In this way the sludge mixture comes downwards against the rising flow of air coming in through the filter channels. (Sandoski-FIRL)
W76-02845

SEWAGE AERATION TURBINE.
Derwent Belgian Patents Report, Vol 5, No 6, p 2, March 14, 1974. Belgian Patent 805,018, Applied September 19, 1973, Issued January 16, 1974.

Descriptors: *Venturi flumes, *Patents, *Axial flow turbines, Aeration, *Sewage treatment, Cavitation, *Waste water treatment.

The blades of the axial flow turbine are closely surrounded by the throat of the Venturi tube and at least some of them are hollow with orifices at their tips. The drive shaft from the external motor also is hollow and has holes in its walls loading to an annular space connected by one or more pipes to the atmosphere. The number and shape of blades and the motor speed produce safer cavitation at the tips. (Sandoski-FIRL)
W76-02846

FURNACE FOR BURNING SEWAGE AND LIKE RESIDUES,
Lucas Furnace Developments Ltd., Wednesbury (England). (Assignee).
For primary bibliographic entry see Field 5E.
W76-02847

TREATMENT OF AN AQUEOUS WASTE STREAM CONTAINING AMMONIUM HYDROXIDE,
P. Urban, and R. H. Rosenwald.
Canadian Patent 941,528, Applied October 23, 1970, Issued February 5, 1974. Patents/Breves, Vol 102, No 6, p 513, February 5, 1974.

Descriptors: *Industrial streams, *Ammonia, Sulfur, Oxygen, Hydrogen, Catalysts, *Effluent streams, *Waste water treatment, *Patents.
Identifiers: *Ammonium hydroxide.

The treatment of an aqueous waste stream containing ammonium hydroxide to produce elemental sulfur and ammonia is described. The aqueous stream is catalytically treated with oxygen at oxidizing conditions effective to produce an effluent stream containing ammonium hydroxide (NH4)2S203, and elemental sulfur or ammonium polysulfide. The sulfur and ammonia are separated from the effluent stream containing (NH4)2S203. That stream is catalytically treated with hydrogen at reduction conditions effective to form a substantially thiosulfute free aqueous stream. (Merritt-FIRL)
W76-02850

DRAINAGE BODY AND BIOLOGICAL FILM SUPPORT,
H. Geiger.
Belgian Patent 802,025, Applied July 20, 1972, Issued November 5, 1973. Derwent Belgian Patents Report, Vol 5, No 1, p 4, February 7, 1974.

Descriptors: *Sewage treatment, *Drainage area, Microorganisms, *Biological treatment, Biodegradation, *Waste water treatment, *Patents.

A drainage body and biological film support for sewage treatment are described. The drainage body consists essentially of an assembly of elements having a large surface area which serves for the growth of the biological film. At infrequent intervals this film is detached, independently of the water and sewage feed, by means of scrapers. This is done before the mass becomes detached by itself so that it is not entrained in the water. Regular operation of the drainage body and maximum degradation of the sewage is obtained in minimum possible space and with the largest possible purification capacity. (Merritt-FIRL)
W76-02851

CHAIN EXTENDED POLYELECTROLYTE SALTS AND THEIR USE IN FLOCCULATION PROCESSES,
E. Witt.
Canadian Patent 941,539, Applied May 17, 1971, Issued February 5, 1974. Patents/Brevets, Vol 102, No 6, p 516, February 5, 1974.

Descriptors: *Polyelectrolytes, *Flocculation, Nitrogen, Polymers, Water purification, Clays, Sewage treatment, Dispersion, *Waste water treatment, *Patents.

The preparation of chain extended polyelectrolyte salts is described for use in flocculation processes. Water soluble poly (quaternary ammonium) polyether polyelectrolyte salts containing quarternary nitrogen atoms in the polymer backbone and chain extended by ether groups are prepared by treating the polymeric reaction product from an N,N,N', N'-tetraalkyl-hydroxy substituted diamine and an organic dihalide such as a dihaloalkane or a dihalo ether with and epoxyhaloalkane. These polyelectrolytes are used in processes for flocculating particles dispersed in aqueous media, e.g., white water clarification, clay flocculation, sewage treatment, and wet-end addition, by adding the polyelectrolyte to the aqueous media in amounts sufficient to flocculate the dispersed particles. (Merritt-FIRL)
W76-02852

WATER TREATMENT ION-EXCHANGE VESSEL,
J. P. Madern.
French Patent 2,179,573, Applied April 10, 1972, Issued November 23, 1973. French Patents Abstracts, Vol 5, No 3, p 1, February 21, 1974.

Descriptors: *Filters, Water treatment, *Ion exchange, Water purification, *Resins, *Waste water treatment, *Patents.
Identifiers: Backwash.

A water treatment ion exchange vessel is described which continuously regrades the resin bed by circulating resin material. Water for treatment is brought in at the bottom of the vessel where it passes through an ejector to entrain bed material which is carried up a vertical pipe to be returned to the top of the bed while the water runs down through the bed. Back washing is eliminated. The vessel can also be used as a granular filter unit. (Merritt-FIRL)
W76-02855

SEWAGE TREATMENT PLANT,
J. R. Kaelin.
Belgian Patent 801,708, Applied July 2, 1972, Issued October 15, 1973. Derwent Belgian Patents Report, Vol 5, No 1, p 3, February 7, 1974.

Descriptors: *Recirculated water, *Sewage treatment, *Biodegradation, Aerobic conditions, Activated sludge, Sewage systems, Facilities, *Waste water treatment, Effluent, *Patents.

A sewage treatment plant with partial recirculation is described which uses aerobic biodegradation. A central closed top cylindrical mixer tank is subdivided by concentric cylindrical walls, and is staggered in height to form an elongated zigzag path for raw sewage fed into the outer annulus of the mixer tank at its top and pretreated with injected pure oxygen or gas mixture containing it. From the base of the center compartment of the mixer tank, a number of pipes lead to the base of an outer concentric buffer tank and discharge in a peripheral direction into that buffer tank. A limited feedback of liquid with activated sludge is taken from the surface of the buffer tank into the mixer and treated effluent is extracted from the buffer tank. (Merritt-FIRL)
W76-02856

WASTE WATER PURIFICATION,
M. J. O. Siren.
French Patent 2,177,843, Applied March 21, 1973, Issued November 9, 1973. French Patents Abstracts, Vol 5, No 1, p 7, February 14, 1974.

Descriptors: *Sewage treatment, *Water purification, *Suspended solids, Nitrogen, Adsorption, Activated carbon, Aerobic conditions, Nitrates, Separation techniques, Oxidation, *Denitrification, Nitrites, Sedimentation, *Waste water treatment, *Patents.
Identifiers: Methanol.

A sewage and waste water purification method is described which comprises removal of suspended solids and decomposition of nitrogen containing substances. An adsorbent, preferably active carbon, and an oxygen containing gas are introduced into a reservoir in which the waste water and a growing biomass have been stored for > or = 3 days. Aerobic conditions are maintained until the whole ammoniacal nitrogen is oxidized to nitrites or nitrates. The solids are separated by sedimentation and the liquid phase goes into an anaerobic zone to which more adsorbent and an organic carbon source, preferably methanol, are added. The nitrites and nitrates are reduced to elemental nitrogen and the solids are separated by sedimentation. High rates of denitrification are achieved. (Merritt-FIRL)
W76-02858

LIQUID WASTE STABILIZATION PLANT.
French Patent 2,179,712, Applied December 29, 1972, Issued November 23, 1973. French Patents Abstracts, Vol 5, No 3, p 1, February 21, 1974.

Descriptors: *Recirculated water, Sewage, Sludge, Sewage treatment facilities, Liquid wastes, Stabilization, *Waste water treatment, *Patents.

A two stage liquid waste stabilization plant with massive recirculation capabilities is described. Each stage is a discrete tank, free from internal obstacles and connected in cascade with a feedback from the intertank connection via an injector for oxidizing agent to the suction side of the main feed pump for sewage or sludge into the first stage. Approximately 85% (> or = 75%) of the flow from the first stage tank is recirculated. For maximum efficiency the first stage tank is recirculated. For maximum efficiency the pressure in the first stage is maintained at one level by the throttling effect of the jet pump and in the second stage at another level by a reverse pressure centrifugal pump in its outlet side. (Merritt-FIRL)
W76-02860

SEWAGE TREATMENT.
French Patent 7,205,271, Applied August 1, 1972, Issued October 15, 1973. French Patents Abstracts, Vol 5, No 2, p 1, February 4, 1974.

Descriptors: *Sewage treatment, *Separation techniques, *Recycling, Disinfection, Water purification, Liquid wastes, Solid wastes, *Waste water treatment, *Patents.

A sewage treatment is described in which the sewage is flushed from several receivers to form a mixture of liquid and sewage. The mixture is separated into high solid content and high liquid content proportions. The solid matter is separated from the liquid in the part with high liquid content. A chemical composition is maintained in the liquid so that the liquid is a disinfectant and deodorant. A bleaching action is maintained in the liquid so as to have a decolorizing effect. The liquid is recycled and reused. The solid particle is reduced and the high solid content portion is stored until all the solid has been chemically broken down by the liquid. (Merritt-FIRL)
W76-02861

WASTE WATER PURIFICATION.
Belgian Patent 801,541, Applied June 27, 1973, Issued December 27, 1973. Derwent Belgian Patents Reports, Vol 5, No 3, p 4, February 21, 1974.

Descriptors: *Water purification, *Waste water treatment, *Activated carbon, Suspended solids, Organic matter, Municipal wastes, Industrial wastes, Adsorption, Oxygen, Growth rates, Control, *Patents.

A method of waste water purification using active carbon with aerobic growth control by oxygen treatment is described. Suspended and dissolved organic impurities are removed from sanitary municipal or industrial waste water, including petroleum refinery effluents, by passing the water preferably upward through one active carbon bed. The bed is treated with 0.040-0.07 kg oxygen for each 0.45 kg oxygen consumed by chemical oxygen requirement-impurities removed from waste water. The active carbon bed is preferably rinsed periodically by passing water upward at a sufficiently high rate to diminish biological growth collection on active carbon. In a preferred process, 0.02-0.5 kg oxygen are supplied for each 0.45 kg oxygen consumed by chemical oxygen requirement impurities removed from waste water. During rinsing the active carbon is treated at intervals with an oxygen containing gas stream. (Merritt-FIRL)
W76-02862

WASTE-WATER PURIFICATION.
French Patent 7,301,794, Applied March 14, 1973, Issued November 7, 1973. French Patents Abstracts, Vol 5, No 2, p 2, February 14, 1974.

Descriptors: Water purification, *Organic matter, *Oxidation, Reduction, Nitrogen, Adsorption, Sludge, *Biological treatment, *Aerobic conditions, Organic compounds, *Waste water treatment, *Patents.

The purification of waste waters by simultaneous removal of organic carbonaceous material and biological oxidation of the reduced nitrogenous forms in waste waters followed by subsequent reduction of the oxidized nitrogen to elemental nitrogen is described. An aqueous suspension of a suitable adsorbent is added to a vessel containing waste water and a developing active biomass having a sludge age of > and = 3 days. Aerobic conditions are maintained to oxidize the ammoniacal nitrogen to nitrite or nitrate nitrogen. The adsorbent, associated adsorbed organic material, and biological solids are separated, and the solids are returned to the vessel. The liquid phase goes into an anaerobic zone to which further adsorbent and a source of organic carbon is added. The oxidized

nitrogen forms are reduced to elemental nitrogen and the mixture goes to a quiescent zone where the adsorbent and associated organic material are removed from the waste water. (Merritt-FIRL)
W76-02863

AN ECONOMIC EVALUATION OF ALTERNATIVE SEWERAGE PRICING AND INVESTMENT PRACTICES: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-02864

DYNAMICS OF HAZARDOUS ELEMENTS IN WASTEWATER PONDS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
J. B. Lisiecki, and C. D. McNabb.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 404, $5.50 in paper copy, $2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, East Lansing, (December, 1975). 90 p, 4 fig, 39 tab, 32 ref, append. OWRT A-073-MICH(1). 14-31-0001-4022.

Descriptors: *Michigan, *Oxidation lagoons, Waste water treatment, *Vascular plants, Temperature, Light, Dissolved oxygen, Copper, Cadmium, Plant populations, Germination, Zooplankton, Invertebrates, Michigan, Sediments, Hydrogen ion concentration, Oxidation-reduction potential.
Identifiers: Metal budgets, Water quality management project, Lemma minor L., Waste stabilization ponds, Ceratophyllum demersum L., Potamogeton foliosus Raf.

A detailed record was developed of temperature, light, dissolved oxygen, Eh, pH, and sediment characteristics for a municipal waste stabilization pond in Michigan in which the dynamics of copper and cadmium were studied over the growing season. The submersed vascular plants, Ceratophyllum demersum L. and Potomogeton foliosus Ref., and the epineustic Lemma minor L. formed the principal plant population in the pond. Their degree of participation in the budgets of the metals is described. Budgets for total copper and total cadmium were developed for the pond at two or three week intervals from May through September. For the period of study, the plants had a net loss equivalent to 2% of the copper influent to the pond. There was a net removal of cadmium by the pond for intervals from the start of the study to mid-August. The aquatic plant community showed a net gain in cadmium until mid-August, and a net loss with senescence thereafter. The zooplankton and benthic macroinvertebrates of the pond showed net gains and losses that were a very small fraction of the total budgets of the elements. Less than 5% of the quantity of either element influent after the initiation of growth in spring could have been removed by a harvest of the aquatic plants that would have been timed for maximum removal.
W76-02867

PHYSICOCHEMICAL APPROACH TO WATER AND WASTEWATER FILTRATION,
Maine Univ., Orono. Dept. of Civil Engineering.
M. M. Ghosh, T. A. Jordan, and R. L. Porter.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE1, p 71-86, February, 1975. 6 fig, 4 tab, 19 ref, 2 append. OWRT A-023-ME(1).

Descriptors: *Waste water treatment, *Filtration, *Mathematical models, Model studies, Filters, Design criteria, Optimization.
Identifiers: *Physico-chemical treatment, Granular filters, Sand filters.

The prerequisite to the optimization of granual filter design is a reliable mathematical description of the capture of suspended particles by packed collector grains within a flow. A conceptual model is presented which has been developed for the depth filtration of water and waste water using packed beds. The removal of small particles through uniform sand beds under low speed flows based on the concentration boundary layer theory of diffusional deposition of particles is described. The model is an extension of that proposed by Spielman and Fitzpatrick and includes the effects of gravity, interception, hydrodynamic forces, London attraction, and Brownian diffusion for systems with negligible double layer repulsion. The ultimate capture of a particle in a packed bed is determined by the transport mechanisms and also by the short-range surface forces which are shown to have a dominant role in the particle's attachment to media grains. Experimental results obtained for the filtration of secondary effluent using a polymer-coated sand bed agreed with the predictive model for systems where the effluent was preconditioned using polymeric aids to reduce the double layer forces to a minimum. Jar tests or electrophoretic mobility measurements can be used to determine the optimum dosage of a destabilizing chemical. It was concluded that with proper control, sand filters may be used for the effective removal of very small particles of 0.1 micrometer or less such as viruses and other biocolloids and colloidal inorganic solids. (Orr-FIRL)
W76-02873

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
B. C. Yen, and A. S. Sevuk.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE4, p 535-553, August, 1975. 4 fig, 5 tab, 15 ref. OWRT B-043-ILL(10) and C-4123(9023)(3).

Descriptors: *Design criteria, *Model studies, *Sewerage, Storm runoff, Water resources development, Water management(Applied), Combined sewers, Networks, Mathematical models, Storm drains, *Drainage, Urbanization.
Identifiers: *Steady-flow routing model, *Chicago models, *Kinematic wave models, Flow models, Storm water management model, Illinois Storm Sewer System Simulation Model, British road research laboratory method.

Design methods for sizing the pipes of storm or combined sewer systems are evaluated and compared. Such methods include: the steady-flow routing method that is usually used for sewer mains in conjunction with the rational method; the Chicago method; the EPA Storm Water Management Model (SWMM); the Illinois Storm Water Sewer Simulation Model (ISS) model; and a simplified transient flow model called the kinematic wave model. It is assumed that layout of the sewer network is previously determined, and only hydraulic aspects of sewer design are considered. From this study it was concluded that the steady-flow routing method is relatively the simplest, does not require computer, and can be used for small networks or when high accuracy is not necessary. Of two versions of this method, one which uses time shifting of hydrographs is recommended. No improvement in design of sewers was found using the Chicago or the British Road Research Laboratory (RRL) methods, and they were more complicated than the time-shifting version of the steady-flow method. The ISS Model is the most accurate method of sewer design and is recommended when high accuracy is required and for design of large sewer systems. This model can also be used to evaluate the effect of retention storage in a sewer system on storm runoff. However, the ISS model requires the use of digital computers. The SWMM and the kinetic-wave models should be used for a performance quality rated between the ISS and steady-flow routing models; they provide moderate accuracy and may be applied to large sewer networks. (Kramer-FIRL)
W76-02875

MINIMIZATION OF COMBINED SEWER OVERFLOWS BY LARGE-SCALE MATHEMATICAL PROGRAMMING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
J. W. Labadie, N. S. Grigg, and P. D. Trotta.
Computers and Operations Research, Vol 1, Nos 3/4, p 421-435, December 1974. 6 fig, 1 tab, 34 equ, 14 ref.

Descriptors: *Combined sewers, *Overflow, *Water pollution control, Operations research, Storage, Storm water, Algorithms, Optimization, Constraints, Simulation analysis, Dynamic programming, Mathematical models, Systems analysis, *Computer programs.
Identifiers: *Automatic control, Orthogonal polynomials, Separability, Minimization, Receiving waters, Urban overflows, System decomposition, *Flow-projection technique, Quadratic programming.

There is a critical need for control strategies for minimizing receiving water pollution caused by overflows from combined sewer systems. As a viable approach to this problem, control is carried out through regulation of ambient and/or auxiliary storage in the system. The goal is to detain storm flows in the system long enough to prevent flows of a magnitude that exceeds treatment plant capacity, thereby reducing overflow into receiving waters. The problem is first attacked by dividing the large combined sewer system into several mildly interconnected subsystems for which control logic can be developed from application of mathematical programming algorithms consistent with the special characteristics of each subsystem. A flow-projection technique is developed for subsystems not amenable to direct solution by standard optimization methods. In comparison with other techniques, the flow projection method has the advantage of greater flexibility in that any flow routing technique can be supplied as a subroutine in the computer program, without requiring restructuring the rest of the program. Initial computation results indicate that convergence characteristics are satisfactory. More experience is needed for a wide range of flow routing models and subbasin reserovir configurations. The eventual goal is a generalized computer code for considering any model and configuration associated with any subbasin. (Bell-Cornell)
W76-02878

CHANGE OF SOME PHYSIOLOGICAL AND BIOCHEMICAL INDICES OF PHRAGMITES COMMUNIS TRIN. WITH DIFFERENT MINERAL NUTRITION UNDER EXPERIMENTAL CONDITIONS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-02942

DEMONSTRATION OF A METHODOLOGY FOR DREDGED MATERIAL RECLAMATION AND DRAINAGE,
Dames and Moore, San Francisco, Calif.
For primary bibliographic entry see Field 5E.
W76-02945

HOW ABITIBI INSULATION BOARD MILL ACHIEVES ZERO EFFLUENT DISCHARGE.
For primary bibliographic entry see Field 3E.
W76-02947

SEDIMENTATION-FLOTATION (SEDIMENTATION-FLOTATION),
A. Bolling.

Der Papiermacher, Vol 25, No 8, p 122-123, August 2, 1975.

Descriptors: *Pulp wastes, *Sedimentation, *Flotation, Pulp and paper industry, Equipment, Design, Waste water treatment, Waste treatment.
Identifiers: *Savealls, Fiber recovery, White water.

The design principles of sedimentation, flotation, and combined sedimentation/flotation savealls used in the paper industry are outlined. (Speckhard-IPC)
W76-02948

TREATMENT OF ELECTROPLATING WASTE WATERS BY A FLOTATION TECHNIQUE,
Trent Polytechnic, Nottingham (England). Dept. of Physical Sciences.
G. E. P. Elliott, and M. J. Hanbury.
Effluent and Water Treatment Journal, Vol 15, No. 9, p 475, 478-481, September, 1975. 6 fig, 9 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Heavy metlas, *Foam fractionation, *Froth flotation, Flotation.
Identifiers: Electroplating wastes.

An experimental study is described which tested foam fractionation and froth flotation treatment of electroplating waste waters containing nickel. Cetyltrimethyl ammonium bromide (CTAB), a polyethylene oxide (Nonidet P40), and sodium dodecyl benzene sulfonate (Na-DBS) were tested as collectors and frothing agents. The simulated waste waters contained nickel sulfate, sodium chloride, hydrochloric acid, sodium hydroxide, collector, and commercial additives such as hardeners and brighteners. The process was also tested with actual electroplating swill waters. The extraction of nickel hydroxide from electroplating swill waters by precipitate flotation using Na-DBS as collector and frother is rapid and nearly complete. The presence of borate ions (a constituent of some plating additives) inhibits this extraction, but seriously only at a level of 0.30 mol/liter. The results of this study form a basis for the implementation of full-scale treatment of effluents from metal plating plants. (Orr-FIRL)
W76-02973

COMPACT INDUSTRIAL EFFLUENT FLOTATION APPTS.
French Patent FR 2248-086. Issued June 20, 1975. French Patents Abstracts, Vol. W, No 30, p D3, September 2, 1975.

Descriptors: *Waste water treatment, *Flotation, *Industrial wastes, Equipment, *Patents, Pulp and paper industry, Suspended solids, Flocculation, Coagulation, Chemical reactions, Separation techniques, Recycling, Colloids.

A flotation apparatus and process designed for the separation of suspended soilds (SS) and/or colloidal particles from industrial waste water, such as papermill effluents, has been patented. The main body of the equipment is a longitudinal reservoir with a feed for the effluent at one end and a purified water overflow at the other end. A mixture of floculating and coagulating agents is fed into the reservoir. The base of the reservoir slopes to produce an upward flow of the effluent to be treated and the reagents. Prior to being fed into the reservoir, the waste water is saturated with air. Flocculation of the colloids begins as soon as the effluent and reagents are mixed; the flocculated colloids are entrained in a battery of rapid lamellar separation cells. The SS float to the surface of the reservoir and are removed by scrapers. The separated matter is segregated so that the two types of particles can be collected at two different points in the system. The collected particles are then recycled into the manufacturing process. (Orr-FIRL)
W76-02974

SEPARATION OF ESP. OIL IN WATER EMULSIONS.
French Patent FR 2248-068. Issued June 20, 1975. French Patents Abstracts, Vol W, No. 30, p J1, September 2, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Emulsions, Oily water, Separation techniques, Equipment, *Patents.

An oil/water separator has been granted a patent. The equipment consists of sections of coalescing media compressed together in a housing, and sorbing media. The sorbing medium is formed from microfibers of polymers based on ethylene, propylene, or styrene; the coalescing medium is glass fibers. Contaminated liquid flows along substantially continuous, thin, low pressure drop paths in the coalescing medium. The dispersed phase is sorbed by the sorbing medium at the interfaces. The sorbing medium is preferentially wetted by the dispersed phase. (Orr-FIRL)
W76-02975

RECOVERY OF SOLVENTS FOR THE PAINT AND ALLIED INDUSTRIES,
F. A. Howard.
Paint Manufacture, Vol. 45, No. 7, p 22-23, September, 1975. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Paints, Recycling, Solvents, Costs.

Recent shortages and price increases of solvents have made paint manufacturers and users aware of the need for solvent recycling. Solvents that can be recovered in the paint industry include those used in: cleaning surfaces before painting; leaning paint application equipment; cleaning paint mills at the manufacturing stage; and paint stripping. The first step in instituting a recovery process is to identify the recoverable wastes produced in a factory then set up a collection and storage system. Waste streams should be segregated to allow recovery to be performed most efficiently and economically. Surface pre-cleaning solvents typically contain water, dirt, oil and grease. These solvents can be processed to meet original specifications provided that contamination with other solvents is avoided. Solvents used in cleaning paint application and manufacturing equipment are normally recovered as mixtures for reuse in cleaning applications, however, they can also be recovered to specifications permitting reuse in formulation. Solvents used for industrial paint stripping are usually mixtures based on methylene chloride and are not normally recovered. Recovery of these solvents might be feasible if a large solids build-up is prevented. Waste paints should be disposed of in an acceptable manner; some of the paint may be recycled to other colors or applications. The minimum amount of recoverable solvent that is normally processed is 500 gal. If the solvent is low priced, then a minimum lot size would be 2000 gal. Services are available in Great Britain from the Chemical Recovery Association for recovering bulk and drum material. Cost depends on the type of solvent, contamination level, and ease of recovery; it is normally between 0.15 and 0.30 pounds/gal. (Orr-FIRL)
W76-02976

ANAEROBIC TREATMENT OF INDUSTRIAL WASTES,
G. W. Scammell.
Process Biochemistry, Vol. 10, No. 8, p 34-36, October, 1975. 5 fig, 13 ref.

Descriptors: *Waste water treatment, *Anaerobic digestion, *Anaerobic conditions, *Industrial wastes, Methane, Carbon dioxide, Odor, Sludge, Biochemical oxygen demand, Chemical oxygen demand, Kinetics.
Identifiers: Solids retention time.

In the anaerobic digestion process, over 80% of the BOD is removed in the gaseous form as a mixture of methane and carbon dioxide. Thus, 85% of the energy of degradation is preserved as a gas that can be used in gas engine generators, or heating equipment. The anaerobic process produces only 10-20% of the sludge produced by a high-rate aerobic process and less than half of that produced by an extended aeration plant. The sludge is also more stable and less odorous than aerobically produced sludge. Anaerobic digestion can be considered as occurring in two stages: hydrolysis and breakdown of complex materials to simple fatty acids, plus hydrogen carbon dioxide, ammonia, and salts; and, production of methane and additional carbon dioxide from the fatty acids and hydrogen. The kinetics of anaerobic digestion can be considered to be those of the rate-limiting stage (the second stage). The rate of COD reduction is related to the growth of bacteria by a Monod type relationship. The kinetics functions presented provide a working basis for the process. In the contact anaerobic process, the solids retention time (SRT) can be varied independent of the hydraulic retention time (HRT), producing a more compact process. With good process control, anaerobic treatment has considerable economic advantages over aerobic processes. (Orr-FIRL)
W76-02977

WASTE LIQUID TREATMENT METHOD BY THE ROTATING DISK CONTACT OXIDATION METHOD (KAITEN DESUKU NO SESSHOKU NI YORU HAISUI SHORIHO),
N. Nakamura.
Kemikaru Enjiniaringu, Chemical Engineering, Vol. 18, No. 8, p 44-49, August, 1973. 3 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Pre-treatment, Food processing industry, Filtration, Oxidation, Biological treatment, Microorganisms.
Identifiers: Rotating disk, Contact oxidation, Bean paste manufacturing wastes.

Liquid wastes from the manufacture of bean paste have been treated using the rotating disk-contact oxidation method. Preliminary treatment was carried out by filtering the liquid waste with a 60-mesh sieve and removing the volatile acids with a skimmer. The resultant water was fed to a storage tank to which excess sludge from the sedimentation basin of the rotating disk was added. The water was then passed through the contact oxidation basin to the sedimentation basin from which sludge was removed to the oxidation basin. Contact oxidation by the biological film of the rotary disk depends largely on the living environment of the microorganisms. (Seigle-FIRL)
W76-02978

TREATMENT OF GLASS MANUFACTURING LIQUID WASTE (GARASU KAKO HAIEKI NO SHORI),
T. Kobayashi.
Kogaku Gijutsu Kontakuto, Optical Technology Contact, Vol. 11, No. 5, p 24-28, May, 1973. 6 fig, 4 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, Lead, Cadmium, Zinc, Arsenic, Neutralization, Polymers, Coagulation, Separation techniques, Hydrogen ion concentration.
Identifiers: Optical glass manufacturing wastes.

Liquid waste from optical glass manufacturing contains large quantities of heavy metals such as lead, cadmium, zinc, chromium, arsenic, and thorium. Metals other than cadmium can be easily removed as hydroxides in alkali solution. For the complete treatment of the liquid waste, a sequence of seven steps is required. These include: the addition of 50 ppm tin salts; the addition of 100 ppm iron salts; adjustment of the pH to 12 by caustic soda; adjustment of the pH again to 10 with PAC;

the addition of 200 ppm polymer coagulant; the separation of solids from liquid; and, the final adjustment of the pH. By this method, the cadmium content in the liquid waste can be reduced from as high as 0.18 ppm to 0.01 ppm. (Seigle-FIRL)
W76-02979

OXYGEN BLEACHING-A MILL PROVEN SOLUTION TO POLLUTION ABATEMENT (SANSO, ARUKARI HYOHAKU NI YORU HAISUI NO OSEN BOSHI),
S. Mizuguchi.
Kamipa Gikyo-shi, (Journal of the Japanese Technical Association of Pulp and Paper Industry), Vol. 27, No. 8, p 3-14, August, 1973. 16 fig, 3 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Water pollution abatement, Screens, Filtration, Biochemical oxygen demand, Color.
Identifiers: Oxygen bleaching.

The oxygen bleaching process developed at the Husum factory in Sweden has proven successful in producing fine quality pulp with few pollution problems. The apparatus consists of four batch digesters controlled by computer to minimize the deterioration of untreated pulp, a batch diffuser for washing both black solution and clean water, a screen which transfers waste to a cyclone cleaner, a filter-I regulator for supplying adequate concentrations of pulp for the next pressing, a press, an oxygen column, and a filter-II in which clean water is circulated for final washing. Results indicate that the BOD of the waste water is reduced 40 to 50 percent and color, more than 70 percent. (Seigle-FIRL)
W76-02980

STUDIES ON INDUSTRIAL WASTEWATER TREATMENT IN CLOSED SYSTEM-PART 1, RECOVERY OF RAW-MATERIAL, LACTAM MONOMER FROM NYLON (6) PROCESSING WASTE,
Osaka Univ. (Japan). Dept. of Technology.
H. Tajiri, and I. Matsui.
Nenryo Kyokai-shi, (Journal of Fuel Society of Japan), Vol 52, No 555, p 609-617, July, 1973. 8 fig, 10 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Laboratory tests, Pilot plants, Activated carbon, Recycling.
Identifiers: Nylon manufacturing, Lactam, Acetone, Steam treatment.

Experiments have been conducted both in the laboratory and at pilot plants to study the recovery of lactam from the waste water of nylon manufacturing. In this method, 10 to 30 grams to activated carbon are added to a water solution containing 2.78% lactam and the mixture is stirred for one hour. Measurements of the lactam concentration in the residual solutions showed that between 1.8 and 2.74% was recovered. At a pilot plant, 140 grams of activated carbon were column-packed and a high concentration waste water containing 1500-2000 mg/liter of lactam was passed through at 55C and a rate of 0.45 cu m/hour for 20 hours. Approximately 90% of the lactam was recovered by acetone and super-heated steam treatment. (Seigle-FIRL)
W76-02981

INDUSTRIAL WASTE LIQUID TREATMENT BY NEW COALESCERS (SHINHOSHUZAI NI YORU SANGYO HAISUI SHORI GIJUTSU).
Sangyo to Kankyo (Industry and Environment), Vol 2, No 8, p 64-70, August, 1973. 8 fig, 3 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, Coalescence, Foaming, Copper, Hydrogen ion concentration, Chemical reactions.
Identifiers: Chemical treatment.

N-alkylethylenediamines and N-alkyldiethylenetriamine were prepared from C12 to C18 alkyl halides and ethylenediamine or ethylenetriamine as new coalescers for the removal of metals in waste water. The new reagents have the following characteristics: solubilily in water; capabilily of foaming in water when combined with metals; and applicability over a wide range of pH. In testing, a given quantity of the reagent was added to water containing metal ions and air or nitrogen gas then was passed through the liquid at a flow rate of 300 ml/min for approximately 12 minutes. The formation of foam required 10 to 12 minutes depending on the quantity of the reagent used. Results showed that N-dodecylethylenediamine was the most effective reagent among the alkylethylenediamines for removing copper ions at a pH value about 6, while the optimum pH value for N-alkyldiethylenetriamine ranged from 6 to 10. Also, it was found that 2 to 3 equivalents of the reagent were necessary for best results. (Seigle-FIRL)
W76-02982

APPLICATION OF BACTERIA FOR A NEW TREATMENT METHOD OF FACTORY LIQUID WASTE (SHIN-BISEIBUTSU NI YORU KOJO HAISUI SHORI E NO OYO),
S. Kojima.
PPM, Vol 4, No 8, p 43-49, August, 1973. 8 fig, 4 tab, 3 ref.

Descriptors: *Filtration, *Biological treatment, *Membrane processes, *Chemical wastes, *Waste water treatment, Liquid wastes, Biochemical oxygen demand, Ammonia.

From experimentation, repeated horizontal filtering of polluted water through an open layer of sand was found effective for purifying water because of the constant supply of oxygen. In order to create biological membranes to repeat filtering and to make purification more effective, the tube contact oxidation system was devised as a compact biological treatment system for factory liquid wastes. In this system, three layers of concentric cylinders form a tank, with pipe leading air and polluted water into the center cylinder. Honeycomb tubes are packed between the cylinders. After the water is forced through the cylinder the filtered water flows out of the tank through a wider brim and is airlifted by a compressor. The water rises, overflows, filters back through the honeycomb tubes, and is again airlifted. Biological membranes grow on the surface of the walls and water purification becomes more effective. In summer, the rate of elimination of ammonia is 100% in two hours and the rate for BOD is 91% in two hours. (Seigle-FIRL)
W76-02983

TREATMENT METHOD FOR LIQUID WASTE CONTAINING SURFACE ACTIVATORS (KAIMEN KASSEIZAI O GANYU SURU HAISUI NO SHORIHO),
K. Hagiwara, and Y. Murakami.
Mizu Shori Gijutsu, (Water Purification Liquid Waste Treatment), Vol 14, No 6, p 581-585, June, 1973. 8 fig, 3 tab, 5 ref.

Descriptors: *Waste water treatment, *Surfactants, *Liquid wastes, Effluents, Chemical industry, Chemical wastes, Pre-treatment, Oil.

A treatment method for liquid waste containing surfactants, especially non-ionic surfactants, has been devised. The effects of the method are checked by measurement of the TOC in effluents before and after treatment. In this method, various condensed chemicals are added to a solution containing surfactants (200 ppm); iron sulfite is added until a 20 ppm FeS concentration is reached; pH is adjusted (best at 5); and the liquid left to settle. Later, the liquid is filtered and residual TOC measured. With the use of 100 ppm condensers, TOC can be decreased to 5-30 ppm when surfactants are not negatively ionized. In treating effluents, this method should be combined with a liquid waste treatment system; however, this method is quite effective as a pretreatment step for eliminating surfactants and oil. (Seigle-FIRL)
W76-02984

NEW MAGNET POLLUTION REMOVAL METHOD BARED.
The Japan Times Weekly, p 11, July 7, 1973.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, Cadmium, Water pollution control, Magnetic studies.
Identifiers: Ferrous sulfate, Magnetism, Chromium.

A simple method to remove cadmium, hexachromium, and other poisonous heavy metals from industrial waste water is a potentially effective method for combatting pollution. The method, based on the ferromagnetic 'super-neferrite' production process, involves the use of magnetism and ferrous sulfate. This magnetic treatment method is the first successful method to remove heavy metals almost completely. The process can reduce 1800 ppm of cadmium to below 0.1 ppm and 2000 ppm hexachromium to below 0.1 ppm. The advantages include: large amounts of waste water containing many types of heavy metals can be treated; and, ferrous sulfate, a waste produced in large quantities by steel mills, can be used. Ferrite collected from the waste water can be used as magnets. (Sandoski-FIRL)
W76-02986

THE COWS VS. THE SUBURBS,
Washington State Univ., Pullman. Coll. of Engineering.
D. C. Flaherty.
Quest, Vol 6, No 1, p 1-7, March, 1968. 10 fig.

Descriptors: *Dairy industry, Costs, Research and Development, Water pollution, Social aspects, Lagoons, Grants.
Identifiers: Land spreading.

The problem of cow-suburb co-existence, although common in many parts of the United States, is becoming especially acute in certain areas of western Washington. Not only is there as aesthetic problem, but even more critical is the potential water pollution problem. To prove the belief that cows and suburbs can exist together, an extensive research project was begun last May with Dr. Donald E. Proctor, a Research Division sanitary engineer, as the chief investigator. The study is primarily being carried out at the Monroe Reformatory Honor Dairy Farm. Because of flooding problems, Dr. Proctor asked for a Solid Waste Disposal Demonstration Grant. It is anticipated that after the end of the three-year study, the Monroe project facilities will remain in operation. The project facilities will continue to be available for inspection by anyone interested in dairy management. Also, all operating data and evaluation reports will be available for study by interested individuals or agencies. (Cameron-East Central Oklahoma State)
W76-02990

REDUCTION OF TOXICITY OF AQUEOUS SOLUTIONS,
K. Enns, J. J. Byerley, and C. J. Beingessner.
U.S. Patents No 3,900,377, 7 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 937, No 3, p 946, August 19, 1975.

Descriptors: *Patents, *Industrial wastes, *Chemical wastes, *Wastes water treatment, *Electrochemistry, Electrodes, Oxidation, Anodes.
Identifiers: *Cyanides.

The electrochemical process of the invention reapidly reduces the toxicity of cyanide containing aqueous solutions and converts the cyanide ions to relatively harmless by-products. The process involves the electrochemical oxidation of cyanide ions at anodic surfaces. The process is carried out using a large electrode surface area. The large surface area may be provided in a single reactor, or in a number of reactors operating in series or in parallel. The cell preferably utilizes a number of sheet-like electrodes. Adjacent electrodes are closely-spaced apart and each facing pair defines a liquid flow channel. Liquid communication is provided between successive flow channels to provide a liquid flow path through the cell in which the liquid passes successively across the faces of each pair of adjacent electrodes. Typically, the electrodes are flat sheets positioned in parallel horizontal planes with openings being provided through each sheet. The openings are provided in this typical construction at opposite peripheries of each successive sheet electrode. By utilizing a large surface area of electrode in the cell it is possible to operate the cell at a high current while maintaining an overall low current density. (Sinha-OEIS)
W76-02992

5E. Ultimate Disposal Of Wastes

UTILIZATION OF ALL WASTES (VSE OTKHODY -- V DELO),
Khorskii Gidroliznyi Zavod (USSR).
N. F. Kazakova.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 3, p 26, 1975. 1 tab, 1 ref.

Descriptors: *Activated sludge, *Yeasts, *Foods, *Feeds, Sludge, Water pollution sources, Wastes, Industrial wastes, Water pollution control, Sludge disposal, Proteins, Moisture content, Solid wastes, Byproducts, Ultimate disposal.

The use of activated sludge from secondary sedimentation tanks as a yeast additive at the Khorsk hydrolysis plant has been reported earlier (cf. Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 6, p 29, 1974). In this brief report, data are given on the consumption of the activated sludge for this purpose and the composition of yeast (moisture, ash, and protein contents) grown with and without the additive. (Stapinski-IPC)
W76-02509

BIOMASS -- A PRODUCT OF BIOLOGICAL PURIFICATION OF PULPING EFFLUENTS AS FEED FOR POULTRY (BIOMASA -- PRODUKT BIOLOGICKEHO CISTENI ODPADNICH VOD PO VYROBE CELULOZY -- JAKO KRMIVO PRO DRUBEZ),
Research Inst. of Veterinary Medicine, Brno (Czechoslovakia).
L. Najman, M. Toulova, R. +)Jilek, and H. Prochazka.
Biologizace a Chemizace Vyzivy Zvirat, Vol 9, No 4, p 367-374, 1973. 1 fig, 11 ref, 6 tab. English summary.

Descriptors: *Pulp wastes, *Sulfite liquors, *Poultry, *Biomass, *Feeds, Wastes, Industrial wastes, Water pollution sources, Waste water treatment, Biological treatment, Diets, Foods, Nitrogen compounds, Amino acids, Fibers(Plant), Cellulose, Growth rates, Fungi, Proteins, Ultimate disposal, Byproducts.
Identifiers: Arginine, Mycelium sterilium, Spent sulfite liquor, Spent pulping liquors.

Results are reported of experiments in which 7-day-old chickens were fed for 3 weeks a standard diet containing 18% nitrogenous substances (dried milk and soybean extract) and a diet in which up to 20% proteins were replaced by dried biomass of the fungus Mycelium sterilium grown in a spent sulfite liquor medium. An analysis of this material showed that, compared with Torula yeast, brewer's yeast, and yeast grown in spent sulfite liquor, it contains less nitrogenous compounds, less arginine, more sulfur-containing amino acids, and more fiber and ash. The growth rate of chickens fed a diet in which 3 and 5% standard proteins were replaced by the fungal biomass, was higher than on the standard diet. At 10% biomass, the growth rate decreased, and at 20% was lower than on the standard diet. No changes were observed in the activity of amino-transferase, but the blood serum protein level tended to decrease at higher doses of the biomass. The dry weight of the meat remained unchanged, and its taste was improved. (Stapinski-IPC)
W76-02515

FOR A MORE COMPLETE UTILIZATION OF SULFITE AND SULFATE SPENT LIQUORS AND PREHYDROLYZATES (POLNEE ISPOL'ZOVAT' SUL'FITNYE, SUL'FATNYE SHCHELOKA I PREDGIDROLIZATY),
Gosudarstvennaya Planovaya Komissiya, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W76-02516

SPRAY-IRRIGATION OF TREATED MUNICIPAL SEWAGE EFFLUENT AND ITS EFFECT ON CHEMICAL PROPERTIES OF FOREST SOILS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
J. L. Richenderfer, W. E. Sopper, and L. T. Kardos.
U.S. Department of Agriculture, Forest Service, General Technical Report NE-17, 1975. 24 p, 17 fig, 10 ref, 18 tab.

Descriptors: *Municipal wastes, *Irrigation effects, *Soil disposal fields, *Forest soils, Sprinkler irrigation, Spraying, Waste water disposal, Soil properties, Potassium, Calcium, Manganese, Magnesium, Sodiu, Hydrogen, Boron, Phosphorus, Hydrogen ion concentration, Nitrogen, Organic matter, Waste disposal, Chemical properties, Soils.

Several forested areas on two soil types in Pennsylvania were irrigated with treated municipal sewage effluent for 9 years (1963-1971). Soil samples were collected to a depth of 5 ft in 1963, 1967and 1971 and analyzed for potassium, calcium, magnesium, sodium, exchangeable hydrogen, manganese, boron, phosphorus, pH, total nitrogen, and organic matter. Of the 11 constituents analyzed, only potassium, sodium, manganese, exchangeable hydrogen, boron, and phosphorus showed significant changes in concentration over time. Potassium, manganese, exchangeable hydrogen, and boron decreased significantly over time while sodium and phosphorus increased. Indications are that the treatment had no detrimental effects on the soil. (Witt-IPC)
W76-02521

HEAT DISPOSAL IN WATER ENVIRONMENT,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5B.
W76-02559

EFFLUENT YIELDS GYPSUM AND PURE WATER AT CYANAMID'S T102 PLANT,
For primary bibliographic entry see Field 5D.
W76-02586

OXFORDSHIRE WASTE SURVEY INTERIM RESULTS.
Process Engineering, p 5, September, 1975. 1 fig.

Descriptors: *Waste water treatment, *Waste water disposal, *Liquid wastes, *Industrial wastes, Surveys, Heavy metals, Recycling, Waste disposal.
Identifiers: Great Britain.

A survey of industrial waste disposal was conducted on the Oxfordshire area of Great Britain. The Oxfordshire area was chosen because it is served by one Waste Disposal Authority, and it encompasses a wide range of industries and company size, including small firms which would not be able to invest in a treatment plant. The pattern of waste disposal found is illustrated. Preliminary survey results identified the following areas for further study: reclamation of oil in an emulsion with more than 25 percent water; use for currently scrapped offcuts of man-made materials, nonwovens and composites such as textile/plastic/adhesive mixtures; recycling of mixed polymers; recovery of heavily inked or oiled paper; and, reuse of solvents from paint shops. A central reclamation area for waste containing heavy metals is suggested as a means to recover the tons of metals that are lost each year in dilute solutions in different areas of the country. The final results of the survey will determine how big such a site should be, how the site should be run, and what the products should cost. (Orr-FIRL)
W76-02589

LIQUID WASTE INCINERATION BY BALFOUR/NITTETU SYSTEM SOLVES EFFLUENT PROBLEMS, CAN PAY FOR ITSELF OR EVEN TURN WASTE INTO PROFIT.
The Chemical Engineer, No 229/300, p 432, July/August, 1975. 2 fig, 1 photo.

Descriptors: *Waste water treatment, *Waste water disposal, *Liquid wastes, *Industrial wastes, *Incineration, Equipment, Recycling, Inorganic compounds, Organic compounds.

Henry Balfour and Company Limited, Leven, Scotland, is the United Kingdom dealer for the liquid waste incineration and salt recovery system of Nittetu Chemical Engineering Limited of Tokyo, Japan. Waste liquid is sprayed into the incinerator through fluid atomizers. The incinerator consists of a steel shell with high alumina refractory lining with an operating temperature of 800-1100 C maintained by a vertical down firing high energy release burner fired by natural gas, fuel oil or distillation residues. A wide range of standard sizes is available from 0.5 m kcal/hr to 15.0 m kcal/hr. When high COD liquid wastes containing organic/inorganic mixtures or inorganic salts alone are incinerated, inorganic salts can be recovered for reuse or sale. If the inorganic salt solution recovered cannot be reused, the solution can be discharged with a COD level below 20 ppm. Energy savings are realized by using the heat in the combustion gases for preevaporation of the waste before incineration. If it is desirable to recover the inorganic components as a solid, the quench vessel liquor can be treated in a suitable crystallization, filtration, and drying system. A pilot plant has been installed at the Research and Development Center of Henry Balfour and Company Limited. The pilot plant incinerator has total combustion capacity of 0.3 m kcal/hr and can handle up to 120 liters/hr of waste liquid. (Orr-FIRL)
W76-02591

HARGREAVES CLEARWASTE TREATMENT CENTRE, WAKEFIELD.
For primary bibliographic entry see Field 5D.
W76-02592

HEAT TREATMENT OF WASTE SLUDGES,
Chicago Bridge and Iron Co., Oak Brook, Ill. (Assignee).
For primary bibliographic entry see Field 5D.
W76-02597

USE OF DOMESTIC WASTE GLASS FOR URBAN PAVING, SUMMARY REPORT,
Missouri Univ., Rolla. Dept. of Civil Engineering.
W. R. Malisch, D. E. Day, and B. G. Wixson.
Available from the National Technical Information Service, Springfield, Va 22161. Environmental Protection Agency, Report EPA-670/2-75-053, May 1975. 46 p, 23 tab, 25 ref. 1DB314, ROAP-24AIN, Task 19. EP-00329.

Descriptors: *Glass, *Asphalts, *Aggregates, Sieve analysis, *Recycling, Cities, *Asphaltic concrete, Income, Paving, Solid wastes, Lime.
Identifiers: *Resource recovery, Marshall design; Hydrated lime, *Glass-asphalt aggregate, Cullet.

A summary is presented of research on the use of waste glass as an aggregate in asphaltic paving mixtures. Reusing waste glass in this manner would provide an outlet for large quantities of the glass and would permit recycling in urban areas where large accumulations of glass are found. Field tests as well as observations of pavement performance have indicated that field installations of asphaltic paving mixtures containing glass have generally maintained adequate skid resistance and performed acceptably from a structural standpoint. The economic feasibility of using waste glass as an aggregate in asphaltic concrete depends primarily on developing resource recovery systems that can separate glass along with other recyclable components and generate enough revenues from their sale, plus disposal and processing fees, to produce an acceptable return on equity. (EPA)
W76-02657

REVIEW OF LANDSPREADING OF LIQUID MUNICIPAL SEWAGE SLUDGE,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W76-02658

ENVIRONMENTAL ASSESSMENT OF FUTURE DISPOSAL METHODS FOR PLASTICS IN MUNICIPAL SOLID WASTE,
Battelle Columbus Lab., Ohio.
D. A. Vaughan, C. Ifeadi, R. A. Markle, and H. H. Krause.
Available from the National Technical Information Serivce, Springfield, Va 22616. Environmental Protection Agency, Report EPA-67012-75-058, June 1975. 73 p, 5 fig, 15 tab, 47 ref. 1DB314 (ROAP 21BFS, Task 017). R803111-01-1.

Descriptors: *Plastics, *Environmental effects, *Landfills, Forecasting, *Waste disposal, Solid wastes, Evaluation, United States, *Municipal wastes, Water pollution control.
Identifiers: *Plastic wastes.

Production of plastics for engineering and consumer items in the United States has been predicted to reach 113 million tons per year by the year 2000. This figure does not include the production of polymer used for synthetic fiber or fabric. From 31 to 38 million tons of the plastic produced is expected to reach the solid waste stream, depending on the basis of estimation. The largest amount will go to sanitary landfills, and the next largest amount will be thermally treated using such methods as power generation, incineration, and pyrolysis. Small amounts of plastic are expected to be disposed of in open dumps or as litter. Resource recovery for plastics in municipal refuse up to the year 2000 is expected to be insignificant. Air pollution as a result of plastics in the landfills and open dumps will be negligible, even if there is still some burning of open dumps in 2000. (EPA)
W76-02659

HORIZONTAL SPREAD OF WASTEWATER FIELD OVER CALM OCEAN SURFACE,
Montgomery Inc., Pasadena, Calif. M. James.
For primary bibliographic entry see Field 5B.
W76-02687

TRANSFORMATIONS IN QUALITY OF RECHARGING EFFLUENT IN THE SANTA CRUZ RIVER,
Arizona Water Resources Research Center, Tucson.
L. G. Wilson, R. A. Herbert, and C. R. Ramsey.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 169-176, 3 fig, 1 tab, 14 ref.

Descriptors: *Effluents, *Arizona, *Recharge, *Groundwater recharge, *Water quality, Water pollution, Sewage, Nitrogen, Drainage.
Identifiers: *Santa Cruz River, Tucson(Ariz).

Since 1955 secondary treated effluent from the city of Tucson Treatment Plant has been released into the Santa Cruz River, the prindipal drainage tributary of the Tucson basin. Because the river is ephemeral, it has functioned essentially as an artificial recharge facility for sewage effluent. In past years the total volume of effluent artificially recharged amounted to about 31,000 ac-ft per year. Such recharge has affected not only the groundwater levels in the vicinity of the river, but also water quality. Recharge of nitrate is of particular concern. (McLachlan-Arizona)
W76-02750

AN ALTERNATIVE SEPTAGE TREATMENT METHOD: LIME STABILIZATION/SAND-BED DEWATERING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W76-02759

METHOD AND APPARATUS FOR DISPOSAL OF LIQUID WASTE,
PPG Industries, Inc., Pittsburgh, Pa. (Assignee).
J. D. Hummell.
United States Patent 3,748,081. Issued July 24, 1973. Official Gazette of the United States Patent Office, Vol 912, No 4, p 1490, July, 1973, 1 fig.

Descriptors: *Patents, *Waste disposal, *Incineration, Equipment.

Equipment has been patented for the disposal of burning liquid fuel waste. It consists of a vaporizing surface, disposed below a combustion zone and adapted to receive the liquid fuel. The vaporizing surface can be a movable channel extending outside of the apparatus. In operation, the fuel is introduced in liquid form and then vaporized and burned. (Sandoski-FIRL)
W76-02781

RECYCLING BRINE FROM PICKLING,
For primary bibliographic entry see Field 5D.
W76-02782

SEPARATION, DEWATERING AND DISPOSAL OF SUGAR BEET TRANSPORT-WATER SOLIDS,
American Crystal Sugar Co., East Grand Fords, Minn.
For primary bibliographic entry see Field 5D.
W76-02783

DEWATERING OF DISTILLERY SPENT WASH IN THE PRODUCTION OF BY-PRODUCT DREG MEAL,
For primary bibliographic entry see Field 5D.
W76-02784

WAYS TO AN ECONOMIC WATER USE DEMONSTRATED BY THE EXAMPLE OF A SMALL COTTON DYEING PLANT (WEGE ZUR WIRTSCHAFTLICHEN WASSERVEREWENDUNG AM BIESPIEL EINER KLEINEN BAUMOLLFAERBEREI),
For primary bibliographic entry see Field 5D.
W76-02804

FURNACE FOR BURNING SEWAGE AND LIKE RESIDUES,
Lucas Furnace Developments Ltd., Wednesbury (England). (Assignee).
J. B. Stribling.
Official Gazette, Vol 920, No 4, p 1131, March 26, 1974. United States Patent 3,799,074, Applied October 26, 1972, Issued March 26, 1974.

Descriptors: *Waste treatment, Incineration, *Patents, *Burning, *Sewage treatment, Equipment.
Identifiers: *Furnace.

A furnace for burning sewage comprising a chamber enclosing a pool of the sewage and a burner directed downwardly onto the pool to bathe the entire surface of the pool in flame has been developed. The pool has a floor which is conical in two stages so that the area of liquid subject to flame can be controlled by varying the level of the liquid relative to the conical area. (Sandoski-FIRL)
W76-02847

SEWAGE TREATMENT PLANT,
For primary bibliographic entry see Field 5D.
W76-02856

DEMONSTRATION OF A METHODOLOGY FOR DREDGED MATERIAL RECLAMATION AND DRAINAGE,
Dames and Moore, San Francisco, Calif.
C. W. Garbe, D. D. Smith, and S. Amerasinghe.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 896, $5.00 in paper copy, $2.25 in microfiche. Army Waterways Experiment Station Report D-74-5, September 1974. 91 p, 24 fig, 8 ref, 2 append. DACW39-73-C0139.

Descriptors: *Dredging, *Spoil banks, *Disposal, *Waste disposal, Desilting, Reclamation, Solid wastes, Drying, Drainage, Projects.
Identifiers: *Dredged material, Disposal areas.

A controlled field demonstration was conducted to evaluate the effectiveness of a methodology for reducing the volume and improving the physical characteristics of dredged material in confined disposal areas. The procedure involved the almost continuous conditioning of a layer of dredged material slurry by a tracked vehicle to accelerate evaporation of water in order to create a layer of soil from the slurry. The soil layer was then compacted with conventional construction equipment. A two-acre demonstration site was selected near Monroe, Michigan. The site was cleared; the in situ silty sand was compacted and leveled; and a 30-in.-high dike was constructed around the site. Material dredged from the nearby River Raisin was pumped into the test areas to a depth of 20 in. Two tracked vehicles were used to condition the slurry; a rubber-tired tractor was used for a short time. Conditioning was accomplished by operating the vehicles with the blade or bucket lowered about 3 in. into the slurry. The water content dropped from 387% to 36% after 350 coverages (23 days of conditioning). The demonstration showed the feasibility of such conditioning. Should the method be used on a large scale, special equipment should be developed for processing the slurry. The concept of partitioning a containment area into several smaller areas should be considered where staged planning would permit filling operatings in some of the areas while previously filled areas were being conditioned. (Sims-ISWS)
W76-02945

ENVIRONMENTAL CONSIDERATIONS OF SANITARY LANDFILL SITES: PART TWO,
Dames and Moore, New York.
J. A. Fischer, and D. L. Woodford.
Public Works, p 70-73, July 1973. 3 fig, 10 ref.

Descriptors: *Environmental engineering, *Landfills, *Sites, Design, Groundwater, Runoff, Garbage dumps, Topography, Surface-groundwater relationships, Water pollution control, Infiltration, Leachate, Gases, Rodents.

How to avoid environmental problems resulting from sanitary landfills are presented. When geotechnical and ecological factors have been evaluated, sanitary landfill designs can be created using favorable geologic, hydrologic, and topographic feastures of the site. Surface water diversion is usually simple. If groundwater table diversion is required, solid wastes should be placed above the maximum groundwater table; if refuse is deposited below the water table, leachate should be confined by maintaining groundwater gradients toward the landfill. Groundwater tables can rise above levels in the surrounding area due to infiltration and effects of equalizing the head on the area groundwater table. Resulting springs or seeps are nuisances but do not cause areal pollution. The final fill surface and slope can be constructed for maximum runoff to reduce infiltration. Ground- and surface water pollution should be controlled. Leachate can be transported to surface water, concentrated and collected, or retained and recovered. Groundwater should be monitored. Landfill gases can migrate thus may have to be vented. Shredding or baling refuse reduces rodent problems. Adequate cover material reduces infiltration and rodent problems. Holding ponds can be used to collect runoff and settle eroded soils. (Buchanan-Davidson-Wisconsin)
W76-02988

TALES OF AN OBLIGING LADY (SPECIAL REPORT OF SOLID WASTES: LEACHATE CONTROL).
Water and Pollution Control, Vol 111, No 12, p 15-31, 1973. 18 fig, 6 tab, 17 ref.

Descriptors: *Sites, *Landfills, *Waste disposal, *Leachate, Path of pollutants, Hydrogeology, Piezometers, Organaleptic properties, Groundwater, Observation wells, Industrial wastes, Canada.
Identifiers: State-of-the-art, Case studies, Ontario.

Knowledge of hydrogeology, geologic formations, precipitation, groundwater flow, and water tables are vital elements of landfill site selection. Leachate composition and production should be studied to measure its contamination and migration. Soil retards or fixes contaminants by dilution, dispersion, diffusion, filtration, gas exchange, sorption, chemical precipitation, coprecipitation, and microbial activity. In properly designed disposal systems, contaminants will be sufficiently attenuated before reaching a surface or groundwater resource. Site conditions and landfill design determine if refuse should be placed above or below the water table. Typical leachate characteristics are given. Landfill operations in the Grand River Basin, Ontario, are discussed. Landfill leachate decreases in strength with age. Leachate contaminated water may cause noxious odors and tastes. Well pumping can cause an effluent stream to become influent. Methane can be hazard and should be monitored. Where methane gas is high, oxygen is low. Although landfill methods are generally acceptable, problems still exist. In selecting landfill sites, municipalities should consider limitations or long term effects; installation of monitoring systems; preparation of corrective measures if problems arise; ultimate use of the site, and the best way to operate the site to reduce detrimental environmental and social impacts. (Buchanan-Davidson--Wisconsin)
W76-02989

THE COWS VS. THE SUBURBS,
Washington State Univ., Pullman. Coll. of Engineering.
For primary bibliographic entry see Field 5D.
W76-02990

5F. Water Treatment and Quality Alteration

MEMBRANE WATER DEAERATOR INVESTIGATION,
AiResearch Mfg. Co., Los Angeles, Calif.
J. Elam, J. Ruder, and H. Strumpf.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-33589, $4.00 in paper copy, $2.25 in microfiche. Report No. 74-10072, February 26, 1974. 31 p, 8 fig, 6 tab, 16 ref. NASA NAS9-10465.

Descriptors: *Membranes, *Semipermeable membranes, *Deaeration, Treatment, *Water treatment, Equipment, Laboratory tests, Membrane processes, Mathematical models, Air, Separation techniques, Evaluation.
Identifiers: *Life support systems, Hollow fiber membranes.

The purpose of the membrane water deaerator program was to develop data on a breadboard hollow fiber membrane unit that would remove both dissolved and evolved gas from a water transfer system in order to: (1) assure a hard fill of the Extra Vehicular Life Support System (EVLSS) expendable water tank, (2) prevent flow blockage by gas bubbles in circulating systems, and (3) prevent pump cavitation. An analytical model to describe the mass transfer of dissolved gas through the bulk liquid and then through the membrane wall was developed. Then a hollow fiber membrane unit was tested to determine its deaeration characteristics. Finally, a configuration for a flight unit meeting a specific problem statement was evaluated. A number of possible hollow fiber materials were evaluated; for the deaerator requirement, the most promising material was polymethyl pentene. The selection of polymethyl pentene was based on the facts that: (1) the material is a tough plastic that is spinnable into hollow fibers, (2) the permeation rate for the water vapor is low, and (3) the permeation rate for oxygen and nitrogen is high. (Sims-ISWS)
W76-02541

THE OXIDATION OF URIC ACID BY IODINE IN AQUEOUS SOLUTION,
North Dakota State Univ., Fargo. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-02632

STUDY OF CORROSION PRODUCTS IN THE SEATTLE WATER DEPARTMENT TOLT DISTRIBUTION SYSTEM,
National Environmental Research Center, Gig Harbor, Wash. Northwest Water Supply Research Lab.
For primary bibliographic entry see Field 5A.
W76-02660

APPLICATIONS OF DIRECT OSMOSIS: DESIGN CHARACTERISTICS FOR HYDRATION AND DEHYDRATION,
Arizona Univ., Tucson. Dept. of Physics.
For primary bibliographic entry see Field 5D.
W76-02745

APPLICATION OF DIRECT OSMOSIS: POSSIBILITIES FOR RECLAIMING WELLTON-MOHAWK DRAINAGE WATER,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5D.
W76-02746

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL.
Black and Veatch, Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 555, $5.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-75-050a, June 1975. 106 p, 29 fig, 24 tab, 7 ref. EPA 1CB047; ROAP 21AQB; Task 024. DACW 37-74-C-0079, IAG EPA-IAG-D4-0388.

Descriptors: *Asbestos, *Lake Superior, *Filters, Minnesota, Diatomaceous earth, Water supply, Treatment facilities, *Filtration, Waste water treatment, *Water treatment, Pilot plants.
Identifiers: Mixed media filtration, *Diatomaceous earth filtration, Serpentine, *Asbestiform, Amphiboles, Chrysotile, Fiber removal, Duluth(Minn).

Pilot plant research conducted in 1974 at Duluth, Minnesota, demonstrated that asbestiform fiber counts in Lake Superior water could be effectively reduced by municipal filtration plants. During the study, engineering data were also obtained for making cost estimates for construction and operation and both granular and diatomaceous earth (DE) media filtration plants ranging in size from 0.03 to 30 mgd. Both dual and mixed-media granular filters using alum and nonionic polyer, employing flash mix and flocculation without settling and DE filters with alum coated DE as precoat and/or body feed or with Catfloc B added to raw water, produced effluents with amphibole fiber counts below electron microscope detection limits. Turbidity was not a direct measure of fiber count, but amphibole counts were generally lowest at effluent turbidities < or = to 0.1 TU. Chrysotile removal was more diffilut, but mixed media granular filtration with alum and nonionic polymer, and DE filtration with anionic polymer conditioned DE frequently reduced chrysotile fiber counts markedly. Systems for economic reasons recommended for consideration during design studies are: (1) mixed media direct filtration, 5 gpm/ft2, multiple-stage flash mix; (2) dual media filtration, 4 gpm/ft2, single stage flash mix; and (3) pressure DE filtration, 1 gpm/ft2, alum conditioning of precoats and body feed, or alum conditioning of precoat only, and cationic polymer fed to raw water. (See W76-02767 thru W76-02769) (EPA)
W76-02766

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIX A.
Black and Veatch, Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 556, $4.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-75-050b, June 1975. 55 p, 5 append. EPA 1CB047; ROAP 21AQB; Task 024. DACW 37-74-C-0079, IAG EPA-IAG-D4-0388.

Descriptors: *Asbestos, *Lake Superior, *Filters, Diatomaceous earth, Minnesota, Water supply, Waste water treatment, *Filtration, *Dissolved oxygen, Water treatment, Data collections, Pilot plants, Weather data.
Identifiers: Mixed media filtration, Diatomaceous earth filtration, *Asbestiform, Chrysotile, Fiber removal, Duluth(Minn).

This appendix contains a portion of the data collected in the main study. The following categories of information are presented: (1) Weather and lake level data; (2) Operating schedule for pumps at the pumping station; (3) Chemical and physical quality parameters of raw and filtered water; (4) Dissolved oxygen content of raw and finished water; and (4) Bacteriological data for raw and finished water. (See also W76-02766) (EPA)
W76-02767

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIXES B AND C.
Black and Veatch, Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 557, $4.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-75-050c, June 1975. 68 p, 6 append. EPA 1CB047; ROAP 21AQB; Task 024. DACW 37-74-C-0079, IAG EPA-IAG-D4-0388.

Descriptors: *Asbestos, *Lake Superior, *Filters, *Data collections, Diatomaceous earth, Water supply, Treatment facilities, Filtration, Waste water treatment, Water treatment, Pilot plants.
Identifiers: Mixed media filtration, Diatomaceous earth filtration, *Asbestiform, Chrysotile, Fiber removal, Duluth(Minn).

Appendix B contains information on the pilot filters used in the study. Data are presented on the physical aspects of the units (dimensions and equipment configuration) and on the manner in which the filters were operated. Appendix C contains data obtained during the individual pilot plant filter runs. This kind of information will be useful to persons needing to know about specific conditions such as raw water turbidity, filtration rate, and chemical doses or diatomaceous earth types and amounts used for precoat or body feed. (See also W76-02766) (EPA)
W76-02768

DIRECT FILTRATION OF LAKE SUPERIOR WATER FOR ASBESTIFORM FIBER REMOVAL, APPENDIX D.
Black and Veatch, Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 558, $8.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA 670/2-75-050d, June 1975. 228 p, 4 append. EPA 1CB047; ROAP 21AQB; Task 024. DACW 37-74-C-0079, IAG EPA-IAG-D4-0388.

Descriptors: *Asbestos, *Lake Superior, *Filters, *Data collections, Waste water treatment, Water supply, Treatment facilities, *Filtration, Diatomaceous earth, *Water treatment, Pilot plants.
Identifiers: Mixed media filtration, *Diatomaceous earth filtration, *Asbestiform, Chrysotile, Fiber removal, Duluth(Minn).

All graphs of filter head loss and effluent turbidity as functions of the number of hours of filter operation are given. These graphs and the individual filter run data presented in Appendix C (W76-02768) could be used to evaluate filter performance under circumstances in which the production of clear, potable water is the goal, rather than the removal of asbestiform fibers. (See also W76-02766) (EPA)
W76-02769

WATER PURIFICATION.
French Patent 2193-783, Applied July 20, 1973, Issued March 29, 1974. French Patent Abstracts, Vol 5, No 17, p 3, May 31, 1974.

Descriptors: *Patents, *Water purification, *Clarification, *Chelation, Liquid wastes, *Water treatment, Adsorption, *Waste water treatment.
Identifiers: Ligands.

Chelate compounds are formed when contaminated water is purified and clarified by the addition of an element. These chelates with ligands in the liquid adsorb the contamination in the liquid. For example, the ions are iron or carbon cations, formed by applying potential to an iron or carbon electrode immersed in the water. (Prague-FIRL)
W76-02829

WATER TREATMENT ION-EXCHANGE VESSEL,
For primary bibliographic entry see Field 5D.
W76-02855

WATER SOLUBLE BLOCK POLYMERS USED AS SILT CONTROL AGENTS,
Calgon Corp., Pittsburgh, Pa. (Assignee).
R. R. Rumpf, D. E. Farley, and L. J. Quilbault.
U. S. Patent No 3,900,338, 5 p, 2 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 937, No 3, p 935, August 19, 1975.

Descriptors: *Patents, *Industrial water, *Cooling water, *Water treatment, *Water quality control, Recirculated water, Silts, Alluvium, Deposition(Sediments).

Deposits of silt and alluvium found in cooling towers, one-through cooling systems, and like impair the heat transfer capacity of the unit not only by limiting the circulation of water, but by insulating the hot metal surface to be cooled. A composition and method is described for removing and preventing accumulations of mud and silt in cooling systems in which water-soluble polymeric compositions of the A-B-A type wherein the A block represents from 10 to 100,000 mer units of a water-soluble monomer and the B block represents from 10 to 5,000 mer units of N-vinyl pyrrolidone is used as the silt control agent. (Sinha-OEIS)
W76-02991

5G. Water Quality Control

BACKGROUND INFORMATION FOR PROPOSED NEW SOURCE PERFORMANCE STANDARDS: ASPHALT CONCRETE PLANTS, PETROLEUM REFINERIES, STORAGE VESSELS, SECONDARY LEAD SMELTERS AND REFINERIES, BRASS OR BRONZE INGOT PRODUCTION PLANTS, IRON AND STEEL PLANTS, SEWAGE TREATMENT PLANTS: VOLUME 2, APPENDIX: SUMMARIES OF TEST DATA.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs; and Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-229 660, $4.50 in paper copy, $2.25 in microfiche. Publication No. APTD-1352b, June 1973. 67 p, 50 tab.

Descriptors: *Air pollution, *Pollution abatement, *Industries, *Regulation, *Federal government, *Standards, Pollutant identification, Smog, Smoke, Air environment, Pollutants, Public health, Assay, Evaluation, Concrete plants, Industrial wastes, On-site tests, Environmental effects, Asphalt, Sewage treatment plants.
Identifiers: *Pollution control, *Performance standards, *Particulate matter, *Carbon monoxide, *Air standards, Asphalt concrete plants, Petroleum refineries, Lead smelter and refineries, Brass ingot production, Bronze ingot production, Iron and steel plants.

This document provided background information on the derivation of the proposed second group of new source performance standards and their economic impact on the construction and operation of asphalt concrete plants, petroleum refineries, storage vessels, secondary lead smelters and refineries, brass or bronze ingot production plants, iron and steel plants, and sewage treatment plants. Information was also provided on the environmental impact of imposing the standards. The standards require control at a level typical of well-controlled existing plants and attainable with existing technology. To determine these levels, extensive on-site investigations were conducted, and design factors, maintenance practices, available test data, and the character of emissions were considered. Economic analyses of the effects of the standards indicated they will not cause undue reductions of profit margins or reductions in growth rates. This appendix presented summaries of source tests cited in Volume 1. The summaries were concerned principally with tests for particulate matter and carbon monoxide, but also described the facilities, characteristics of exhaust gas streams, and conditions of operation. (Henley-ISWS)
W76-02543

THE EFFECTS OF CURRENTS AND WAVES ON AN OIL SLICK RETAINED BY A BARRIER,
Texas A and M Research Foundation, College Station.
L. A. Hale, D. J. Norton, and C. A. Rodenberger.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-004 675, $9.75 in paper copy, $2.25 in microfiche. United States Coast Guard Report CG-D-53-75, April 1974. 319 p, 150 fig, 19 tab, 56 ref, 1 append. DOT-CG-23357A.

Descriptors: *Oil spills, *Oil pollution, *Currents(Water), *Waves(Water), Oil, Barriers, Oil-water interfaces, Laboratory tests, Oil wastes, Pollutants, Water pollution control, Pollution abatement, Water pollution.
Identifiers: *Oil slicks, Oil slick control, Oil slick behavior, Oil slick flume tests, Oil slick shielding, Fast current oil slick control.

Experimental studies were conducted on the behavior of a floating oil slick subjected to various external mechanical influences and to the action of currents and waves. Specifically, studies were made of the behavior of a thick slick, retained by a barrier, subjected to currents and waves, and subjected to the influence of various slick shield devices. Studies were also made of the effects on a moving thin slick of energy absorbing barriers and various other slick control devices. The laboratory experiments closely duplicated prototype conditions except for wave size. The results of this investigation clarify many previous misconceptions of thick slick behavior and introduce several new concepts of slick behavior including a mathematical model describing the entrainment loss phenomena. Oil diversion schemes, rapid removal schemes, and energy absorption barriers were evaluated in terms of their effect on thin slick behavior at high current velocities. (Sims-ISWS)
W76-02549

ENGINEERING DESIGN HANDBOOK, ENVIRONMENTAL SERIES, PART ONE, BASIC ENVIRONMENTAL CONCEPTS.
Army Materiel Command, Alexandria, Va.
For primary bibliographic entry see Field 6G.
W76-02550

WATER QUALITY MANAGEMENT PLANNING FOR THE ROARING FORK RIVER BASIN IN WESTERN COLORADO,
California Univ., Los Angeles.
J. K. Hopkins.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No 75-16786. PhD Thesis, 1975, 254 p.

Descriptors: *Water management(Applied), Water resources development, *Colorado, Colorado River Basin, River basins, Water quality control, Urban runoff, Model studies, Planning, Computers, Analytical techniques, Capital costs.
Identifiers: Roaring Fork River basin(Colo).

The Water Quality Management Plan for the Roaring Fork River Basin in Western Colorado has been developed. This plan provides a baseline survey of existing water quality in the area, and has been adopted by the Colorado Water Quality Control Commission to become an element of the Colorado River Basin Plan. The investigation in-

cludes the development of a computer model of the basin for the assessment of future water quality, and the analysis of needs and capital expenditures required to maintain high water quality. The Plan also recommends waste load allocations for segments of the Basin. In addition to describing the Water Quality Management Plan, the dissertation presented here described control and treatment of urban runoff in Aspen, Colorado, and analyzes the significance of the contribution of urban runoff to stream degradation. (Kramer-FIRL)
W76-02563

LARGE SYSTEMS APPROACH TO WATER QUALITY MODELLING AND MANAGEMENT,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5B.
W76-02564

DISTRIBUTED PARAMETER SYSTEMS APPROXIMATION FOR ESTUARINE WATER QUALITY MODELLING AND CONTROL,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5B.
W76-02565

OIL SPILL DETECTOR.
For primary bibliographic entry see Field 5A.
W76-02581

DISPERSING OIL IN WATER WITH ALKYDS CONTG. POLYALKYLENE GLYCOL.
Belgian Patent BE 824-514. Issued July 17, 1975. Derwent Belgian Patents Report, Vol W, No 31, p H1, September 9, 1975.

Descriptors: Waste water treatment, *Industrial wastes, *Oily water, Secondary recovery, *Patents, Chemical reactions, Polymers, *Water pollution control, Dispersion.

A patent has been issued for a method of dispersing oil in water with alkyds containing polyalkylene glycol. The alkyd is the reaction product of a polybasic acid, a poly-alcohol, and a monobasic acid. The poly-alcohols which can be used are mono-, di-, or tri-ethylene, -propylene, or -butylene glycols, neopentyl glycol, glycerol, trimethylol-propane or -ethane, (di)pentaerythritol, sorbital, polypropylene glycol or polybutylene glycol. The polyalkylene glycol is polyethylene glycol or poly(ethylene/propylene) glycol, with a molecular weight between 100 and 10,000, preferably between 400 and 5,000. The terminal OH of the polyalkylene glycol may be etherified with an alcohol containing one to six carbons. The alkyd contains not less than 5C, preferably not less than 10C. The polyacids may be phthalic acids, maleic, adipic, glutaric, or trimellitic acids. The monobasic acids can be tall oil acids, or acids from tung oil, soya oil or fish oil. The process is used to disperse oil on water surfaces, in secondary oil recovery, for recovering oil from tar sands, and in the solvent-cleaning of tanks and pipelines. The dispersed oil droplets do not easily recombine. (Orr-FIRL)
W76-02583

WATER QUALITY DETERMINATION APPARATUS,
Kabushiki Kaisha Meidensha, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5A.
W76-02596

SMALL BOAT OIL REMOVAL SYSTEM FOR BILGE WATER,
For primary bibliographic entry see Field 5D.
W76-02598

APPARATUS FOR REMOVING OIL FROM WATER,
Conwed Corporation, St. Paul, Minn. (Assignee).
G. H. Sundin, F. H. Riedel, W. R. Niemi, and R. C. Slocumb.
U.S. Patent No 3,915,859, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2092, October 28, 1975.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Oily water, *Absorption, Sectivity, *Separation techniques, Equipment, Cellulose.
Identifiers: Sensors.

An apparatus is provided for the continuous separation os oil and water. The oil-water mixture is enclosed within a spool. A sheet of selectively absorbent material is wrapped around the spool. The material is capable of passing one of the fluids and of retaining the other fluid. It is also flexible and has structural integrity so as not to tear or hydraulically erode in operation. Cellulose fiber mats are suitable. The mats are composed of wood fiber held together with a water resistant binder such as a phenolic and are reinforced with plastic net to give tensile strength. The spool is rotated while the absorbent material is advanced. As the oil-water mixture is introduced into the spool, the water passes through the absorbent material and the oil is absorbed by the material. An automatic sensor activates a drive shaft to advance the oil laden absorbent material as it becomes saturated and new material is moved into place. (Sinha-OEIS)
W76-02608

VESSEL FOR REMOVING LIQUID CONTAMINANTS FROM THE SURFACE OF A WATER BODY,
Costruzioni Battelli Disinquinanti S. p. A., Rome (Italy). (Assignee).
O. Massei.
U. S. Patent No 3,915,864, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 939, No 4, p 2094, October 28, 1975.

Descriptors: *Patents, *Oil pollution, Oil spills, *Water pollution control, Water pollution treatment, Oily water, *Separation techniques, Boats, Pontoons.

A system is provided for removing contaminant liquid of lower density than water from the surace of a body of water. The surface layer of the water is conveyed into an inverted channel beneath the surface of the water and vortices are formed for the accumulation of the contaminant liquid. A vessel is provided which has at least two pontoons containing tanks for the collection and decantation of the contaminant liquid. The hull of the boat extends between the pontoons in a V shape so that the liquid displaced by the hull is deflected into a downward open channel. A number of spaced apart ribs at the stern of the vessel direct fluid to be collected into collecting channels. By the application of suction the accumulated liquid is transferred into the collection and decanting tanks in the pontoons. (Sinha-OEIS)
W76-02611

DEVELOPING A CORPORATE RESPONSE TO POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass. School of Business Administration.
S. C. Wheelwright.
European Business, p 64-72, Summer 1973.

Descriptors: *Pollution abatement, *Industries, Decision making, Standards, Planning, Management.
Identifiers: Corporate pollution policy.

While public opinion, existing and proposed legislation, employee safety considerations, and rising waste management economics have prompted corporations to engage in environmental protection activities, existing corporate management structures have slowed its implementations. A survey of eight corporations (seven of the multinational) with sales in excess of $100 million each illustrates several factors ranging from inefficient processes to those inherent in the existing management system. The pollution problem definition is also clearly related to corporate growth and previous expertise. Also the location of the waste problem within the management framework and the goals of the respective decision makers affect the implementation of any solution. The corporate structure's allocation of responsibility and authority are further determiners of implementation. The total environment, corporate-industry, and public also provide impetus towards discovering and implementing environmental protection plans. Today's corporate structure must be adjusted. First, it must make policies as to the degree of compliance at different plant locations. Allocation of funds between research, pollution control devices and investments must be made. Second, the corporate structure must clearly allocate responsibility and authority, although such allocation may be evolutionary rather than static. (Schroeder-Wisconsin)
W76-02613

COASE, SOCIAL COST AND STABILITY: AN INTEGRATIVE ESSAY,
California Univ., Los Angeles. Urban Planning Programs.
For primary bibliographic entry see Field 6C.
W76-02616

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: PETROLEUM REFINING INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 336, $5.00 in paper copy, $2.25 in microfiche. Report No EPA-230/2-74-020. December 1974. 82 p, 9 fig, 15 tab.

Descriptors: *Pollution abatement, *Waste water treatment, *Oil industry, *Economic impact, Marketing, Industrial production, Competition, Foreign countries, Distribution, Federal government, Technology, Employment, Water conservation, Pricing.
Identifiers: Oil refineries.

The potential economic impact of the U.S. petroleum refining industry of effluent limitation guidelines and standards of performance that have been established by the EPA Environmental Protection Agency is evaluated. A detailed description of the petroleum refining industry is given, covering the product, market and distribution, government influence, operations, financial structures, utilization rates and trends for the future in financial structure and refinery technology. The costs of treating waste water, and of in-plant reduction of waste water flow, are analysed in some detail, particularly in relation to the effects that these costs will have no profitability and effects on the growth of the industry, employment and adjacent communities. Conclusions about the impact of these costs depend largely upon the assumed form of government involvement in the industry. If U. S. refineries are permitted to compete domestically, but are protected from world competition, the impact may be minimal. On the other hand, continuing current controls on the margin (product revenue less crude costs) realized by large refineries may create problems for many small refineries which will incur much greater unit cost increases than large refineries. (Carpenter-Wisconsin)
W76-02618

ECONOMIC DISINCENTIVES FOR POLLUTION CONTROL: LEGAL, POLITICAL, AND ADMINISTRATIVE DIMENSIONS,
Environmental Law Inst., Washington, D. C.

W. A. Irwin, and R. A. Liroff.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 340, $9.00 in paper copy, $2.25 in microfiche. Report No EPA-600/5-74-026, July 1974, 273 p, 16 append. 68-01-2203.

Descriptors: *Pollution abatement, *Pollution taxes(Charges), *Legal aspects, *Penalties(Legal), Federal government, State governments, Europe, United States, Legislation, Taxes, Regulation, Judicial decisions, Feasibility, Political aspects.
Identifiers: *Pollution disincentives.

A definition of an economic disincentive is presented as a monetary charge levied by government on conduct which is not illegal but which does impose social costs, for the purpose of discouraging that conduct. Disincentives should be distinguished from fines, civil penalties, user charges, license fees, etc., which may have incidental economic disincentive effects. Particularly, pollution charges in Vermont and surveillance fees in Michigan are shown not to be disincentives but rather fines and user charges, respectively. The constitutionality of federal or state imposition of disincentives is examined and the authority of the Environmental Protection Agency and the states to utilize disincentives under selected environmental statues is analyzed. The following are also discussed in detail; (1) The legality of some disincentives adopted by states; (2) charges imposed by some European countries and the difference between these charges and disincentives; (3) the history of some previous proposals for federal disincentives and the political and administrative dimensions of these; and (4) some suggestions for additional disincentives and their feasibility. It is proposed that disincentives are a promising new mechanism for governing pollution and should be carefully considered. (Carpenter-Wisconsin)
W76-02619

CAPITAL INVESTMENT FOR WATER POLLUTION CONTROL AT THE STATE AND LOCAL LEVEL,
Frumkin (Norman), Washington, D. C.
N. Frumkin.
Available from the National Technical Information Service Springfield Va 22161 as PB-228 030, $5.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation. Report August 1972, 91 p, 5 tab, append 68-01-0164.

Descriptors: *Water pollution control, *Sewage treatment, *Investment, *State governments, *Grants, Facilities, Administration, Massachusetts, New York, Ohio, Maryland, Alabama, Texas, New Mexico, California, Washington, Local governments, Federal government, Priorities, Regional analysis, Project planning.

A survey of nine state programs was conducted to determine existing priorities, problems, and approaches to water pollution control. Interviews were conducted primarily with the engineer in charge of the construction grant programs in Massachusetts, New York, Ohio, Maryland, Alabama, Texas, New Mexico, California, and Washington. Questions posed centered on: (1) The state's priorities for water pollution control capital construction; (2) factors emphasized in allocating state funds to municipalities; (3) penalties and incentives used by the state to motivate local action; (4) five-year projections of state capital expenditures for treatment of facilities; (5) quality and capacity standards incorporated in the proposed facilities; (6) factors expected to affect cost and timing of the proposed construction; (7) expected demand for treatment facilities; (8) review procedures local treatment facilities utilized by the state. The survey indicates that municipalities play a major role in the states' investment programs. The states' policy emphasis centers on the provision of treatment facilities in the shortest possible time. Often this policy objective is in conflict with the implementation of the optimal technology and regionalization. The state utilizes encouragement, pressure, legislation and litigation to accomplish policy objectives. State by state profiles are given for each of the questions. (Schroeder-Wisconsin)
W76-02620

THE DELAWARE ESTUARY SYSTEM, ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC EFFECTS: ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-231 424, $4.50 in paper copy, $2.25 in microfiche. Report No NSF-RA-E-74-001, January 1974. 47 p, 9 fig, 1 tab, 79 ref. NSF-RANN GI 33369.

Descriptors: *Environment, *Water quality, *Value, *Evaluation, Attitudes, Analytical techniques, Social aspects, Welfare(Economics), Ethics, Recreation, Ecosystems, Urbanization, Aesthetics, Planning, Intangible costs, Intangible benefits, Economics.

The state-of-the-art analysis of the many different approaches to evaluating environmental quality and with particular reference to water-related environments is discussed. A wide spectrum of related methodology and concepts, including biological, anthropological, religious, aesthetic, philosophic and literary writings are considered in addition to the usual engineering considerations, economic factors and systems analysis methodology. Some approaches are shown to be basically inadequate or without logical merit, while the categorization of environmental quality as 'recreation' or 'aesthetic values' is too narrow. The economists' definitions of 'welfare', 'value', and 'utility' theories as related to optimization of environmental quality are reviewed and criticized, with the conclusion that the problem of evaluation is not insuperable. It is possible to describe relevant parameters and to evaluate them in many money terms, and physical standards can be set for achieving social objectives. The basic environmental objective is not a categorical imperative but can have tradeoffs with other social goals, with marginal economic advantages. (Carpenter-Wisconsin)
W76-02626

LOWER SHEYENNE RIVER BASIN WATER - LAND - PEOPLE.
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 5A.
W76-02627

OPTIMIZATION OF WATER ALLOCATION, WASTEWATER TREATMENT, AND REUSE CONSIDERING NON-LINEAR COSTS, SEASONAL VARIATIONS, AND STOCHASTIC SUPPLIES,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-02636

CONFERENCE ON THE MANAGEMENT OF RECREATIONAL LAKES.
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 6B.
W76-02641

UPGRADING LAKES--LAKE RENEWAL AND MANAGEMENT TECHNIQUES,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
T. L. Wirth, and S. M. Born.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 40-41.

Descriptors: *Recreation, *Management, *Lakes, Techniology, Deterioration, Nutrient removal, Eutrophication, Sedimentation, Aquatic weed control, Oxygenation, *Wisconsin, Dredging.
Identifiers: *Lake rehabilitation.

Lake degradation in the upper Midwest is largely due to acceleration of eutrophication and sedimentation generated by human activities. When these processes speed up, algal blooms, rooted aquatic plant growth, sediment infilling, and declining fisheries occur. Improvement programs could reduce excessive plant growth and improve water quality, but lakes are complicated ecosystems thus their response to treatment is difficult to predict. Many restoration schemes are expensive; years of data are needed to define problems; remedial programs require time; and public institutions are not well structured to implement these programs, thus public demands and expectations are not satisfied. Reduction of sedimentation from the watershed, dredging, and retarding eutrophication help reduce sediment accumulation. Waste water diversion, nutrient removal from effluents, land-use management, and product modification can curb nutrient input. Inlake correction methods include chemical inactivation of nutrients; harvesting biota, dilution, flushing, subaerial exposure and drying, bottom sealing, hypolimnion withdrawal, and dredging. Overfertilization products can be treated by mechanical, chemical, physical, and biologic methods. Mechanical aeration of whole lakes or the hypolimnion and lake deepening are promising methods. Lake upgrading requires public understanding, support, and participation; and is expensive, difficult, and slow. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02645

UPGRADING LAKES--LAND-WATER RELATIONSHIPS,
Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
J. Peterson.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 42-46.

Descriptors: *Recreation, *Lakes, *Water quality control, Water management(Applied), Drawdown, Diversion, Pumping, Oxidation, Sediments, Oxygen demand, Aquatic weed control, Lake sediments, Nutrient removal, Compaction, Dredging, Sediment control, Erosion control, Land management, Urban drainage, Zoning, Waste disposal, Sewage treatment, Secondary treatment, Tertiary treatment, *Wisconsin.
Identifiers: *Lake rehabilitation.

Following dewatering of an impoundment by drawdown, diversion, or pumping, oxidation of the sediments lowers oxygen demands in the water, bottom sediments become desiccated, rooted aquatic plants are controlled, nutrient transfer is limited, and compaction of sediments occurs. Dredging treats the symptoms, not the basic cause; dredging requires spoil disposal, is expensive, and its effects on water quality are unknown. Erosion control by management of agricultural land, gravel mining operations, and urban drainage is preferable. Shoreland zoning regulations include subdivision regulations to protect water resources, zoning codes to preserve wet lands and fragile environments, and sanitary codes to control onsite disposal to prevent water contamination. Sediments and nutrients must be controlled. Diversion can be used for waste disposal, but this does not solve the problem unless the natural system downstream can handle the waste products adequately. Waste treatment techniques can also be used, such as primary methods to remove solid materials and pathogens, secondary methods to reduce oxygen and biochemical ox-

ygen demands, and tertiary methods to reduce nitrogen and phosphorus outputs to limit aquatic plant production. The total environmental effect of lake renewal and management must be considered. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02646

AQUATIC VEGETATION HARVESTING,
Dane County Dept. of Public Works, Madison, Wis.
For primary bibliographic entry see Field 4A.
W76-02647

ALTERNATIVES TO PROTECT AND ENHANCE LAKES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
D. A. Yanggen.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 73-82.

Descriptors: *Protection, *Lakes, *Recreation, *Lake shores, *Water quality, Sedimentation, Eutrophication, Management, Comprehensive planning, Land use, Wisconsin, Regulation, Local governments, Land development, Competing uses, Erosion control, Boats, Zoning, Cooperatives, Building costs.
Identifiers: Lake rehabilitation, Recreational subdivisions.

Lakes and their shorelines face many threats. Water quality problems caused by sedimentation and over-enrichment can sometimes be prevented or corrected by lake renewal and management techniques. Improper uses of shorelands and their consequent deterioration can affect water quality. A shore buffer zone must be guarded by careful protection and planning. Conflicts in surface water use can be reduced by regulations to make aquatic recreation safer by zoning according to use of a fixed area, separating distance between uses, and time; and/or prohibiting certain uses. Individuals can be effective in some lake protection programs; collective action by property owners may be more effective in some areas; and governmental action at various levels may be required in other areas. Advantages and potential problems of recreational developments containing individually owned sites and shared open spaces and facilities are discussed. Property owners' associations can help deal with some problems, such as control of individual lot architectural and environmental development, management and maintenance of open space and recreational facilities, and provision of services. Declarations of covenants and restrictions, articles of incorporation and bylaws of property owners' associations, the final subdivision plat, and the deed of conveyance are all important in effectuating the development plan. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02648

LAKES AND WISCONSIN'S FUTURE,
Wisconsin Office of the Governor, Madison. Lieutenent Governor.
For primary bibliographic entry see Field 6E.
W76-02652

ENVIRONMENTAL ASSESSMENT OF FUTURE DISPOSAL METHODS FOR PLASTICS IN MUNICIPAL SOLID WASTE,
Battelle Columbus Lab., Ohio.
For primary bibliographic entry see Field 5E.
W76-02659

SULFURIC ACID FOR REDUCING SODIUM HAZARD OF IRRIGATION WATER,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-02666

STRIP MINING AND RECLAMATION ON THE BLACK MESA OF ARIZONA,
Arizona Univ., Tucson. School of Renewable Natural Resources.
T. R. Verma, J. L. Thames, and R. T. Pattern.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 47-65, 7 fig, 3 tab, 3 ref.

Descriptors: *Strip mines, *Land reclamation, *Semiarid climates, *Soil conservation, *Water quality, Strip mine wastes, Water pollution sources, Water pollution, Mining, *Arizona, Conservation, Land management, Soil erosion, Land use, Precipitation(Atmospheric), Vegetation, Runoff, Groundwater, Infilitration, Small watersheds, Erosion control, Sediment control.
Identifiers: Black Mesa(Ariz).

Important goals of reclamation on the Black Mesa area of Arizona are: (1) to maximize the water available from precipitation for use by vegetation and/or people and livestock; (2) to reduce the contribution of surface water, which may not be of suitable quality, to the ephemeral streams of the region; and (3) to lessen or facilitate (depending on water quality) deep seepage into groundwater. From a two-year study on a small 5.5-acre watershed in the Black Mesa area, it was found that mined-land reclamation in the semiarid West is significantly different from the reclaimed lands in the humid East. The quality of the surface runoff from the reclaimed mine spoils compares well with proposed Environmental Protection Agency criteria and water from a nearby Indian well. The authors conclude that reclamation should be aimed at erosion and sediment control through land stabilization. As more data is gathered many alternatives for land use and modification can and should be considered, and decisions can then be made using a systems approach incorporating social, economical, ecological, and other related hydrological and biological aspects. (Robinett-Arizona)
W76-02670

WATER RESOURCES MANAGEMENT FOR PART OF THE LOWER GILA VALLEY,
Arizona Univ., Tucson, Dept. of Watershed Management.
For primary bibliographic entry see Field 3F.
W76-02678

MANAGEMENT FOR THE CONTROL OF SALTS IN IRRIGATED SOILS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-02679

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1973.
Australian Water Resources Council Canberra.
For primary bibliographic entry see Field 2A.
W76-02680

GROUNDWATER POLLUTION CONTROL IN AN INDUSTRIALIZED PART OF THE TRENT BASIN,
Trent River Authority (England).
L. H. Dowse, and K. H. Selby.
Water Pollution Control, Vol 74, No 5, p 526-543, 1975. 6 fig, 6 tab, 17 ref.

Descriptors: *Water pollution control, *Industrial wastes, *Groundwater, Aquifers, Pumping, Pollutants, Classification, Monitoring, Wells, Shafts(Excavations), Waste disposal, Sites, On-site investigations, Legislation, Water quality, Water pollution sources, Pre-treatment(Water).
Identifiers: *United Kingdom, *Trent basin, Tips, Pits, Triassic sandstones, Coal measures, Case histories, Surveillance.

This paper was concerned with ways to protect underground water resources in an industrialized part of the Trent area. Problems encountered were outlined. The area is very heavily populated and is also the most highly industrialized part of the United Kingdom. Coarse-grained, poorly cemented Triassic sandstones are the most significant aquifers in the Upper Tame basin. The coal measures series, while much less permeable than the Triassic sandstones, also contains important aquifers. Groundwater is of the calcium bicarbonate type and typically is very hard. Present basinwide pumpage from these aquifers totals 9,670,000 cu m/yr. Factors which control the migration and persistence of pollutants in groundwater are hydrological, physicochemical, and biological. Sources of groundwater pollution include: industrial waste disposal on tips or in abandoned pits; direct discharge into underground strata through wells and mine shafts; accidental causes, such as leakage and spillage; and natural causes. Two types of surveillance have been put into practice by the Trent River Authority: a broadscale license-based system and a localized, intensive investigatory system. The suitability of potential tipping sites was studied and assessments made of the pollution risks. In addition, a classification has begun of wastes and existing disposal sites. (Visocky-ISWS)
W76-02691

AGRICULTURAL RUNOFF POLLUTES SURFACE WATERS, PART I,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-02694

BACTERIOLOGICAL QUALITY OF SURFACE RUNOFF FROM AGRICULTURAL LAND, PART II,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-02695

SIMULATED BEEF FEEDLOT BEHAVIOR UNDER ALTERNATIVE WATER POLLUTION CONTROL RULES,
Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
D. L. Forster.
American Journal of Agricultural Economics, Vol 57, No 2, p 259-268, May 1975. 1 fig, 5 tab, 13 equ, 17 ref.

Descriptors: *Water pollution control, *Feed lots, *Simulation analysis, Behavior, Agriculture, Prices, Methodology, Legislation, Decision making, Optimization, Economics, Farms, Equations, Michigan, Rainfall, Cattle, Environmental control, Pollution abatement, Farms, Mathematical models, Systems analysis.
Identifiers: Control rules, Direct search method, Coarse grid approach, Cost minimization, Sensitivity analysis.

Rules are being established by federal and state agencies to control water pollution from feedlots. In order to investimate the impact of alternative rules, a simulation model was constructed to represent the behavior of beef feedlots in Michigan and similar states over the 1974-85 period. Individual firm behavior was simulated as the firm formed expectations concerning ex ante producution relationships and input and output prices, made decisions based on these expectations, and had its success determined by ex post production relationships and input and output prices. A decision-making process determined the type and level of inputs employed and was used

each time period by each simulated firm. An optimization procedure was used to find the values of four unknown parameter values (initial net worth, rate of return on off-feedlot investments, the determinants of the amount of depbt, and the annual user costs of durable assets). The procedure employed the direct search method and a coarse grid approach. Results indicate that while the alternative rules would not have severe impacts on feedlot production, their impacts would be regressive. (Bell-Cornell)
W76-02720

MODELS IN WATER RESOURCES,
For primary bibliographic entry see Field 6A.
W76-02722

EFFECTS OF SURFACE CONFIGURATION IN WATER POLLUTION CONTROL ON SEMIARID SURFACE MINED LANDS,
Montana State Univ., Bozeman. Dept. of Animal and Range Sciences.
I. B. Jensen.
In: Watershed Management, Proceedings of a Symposium conducted by the Irrigation and Drainage Division of the American Society of Civil Engineers, August 11-13, 1975, Logan, Utah, p 739-749, 2 tab, 3 ref.

Descriptors: *Erosion, *Water pollution, *Vegetation establishment, *Soil moisture, *Spoil banks, *Land forming, Slopes, Grading, Slope protection, Soil erosion, Sediment control, Soil surfaces, Infiltration, Strip mine wastes, Land management, Runoff, Soil conservation.
Identifiers: Gouging, Dozer basins, Deep chiseling.

The generally smooth surfaced, recontoured terrain being left in the wake of strip mining normally provides no depression for impeding runoff but instead, rapidly funnels sediment and nutrient rich excess runoff into the adjacent streams and gullies. Large amounts of the water falling on smooth surfaced recontoured terrain are being completely lost to vegetation establishment and development. The three surface manipulation treatments which are discussed include gouging, dozer basins, and deep chiseling on sloping freshly shaped spoils. Studies conducted over several years show the gouging treatment (applied at the approximate contour of the shaped spoils forming elongated pits about 14-16 inches wide, 2-3 feet long and 6-8 inches deep) stored more water in the upper 4 feet soil, significantly reduced soil moisture stress days, and resulted in better plant survival than did the other treatments. The dozer basin treatment had a higher plant mortality rate (31 percent) than the other two treatments but maintained greater plant density than did the chiseling treatment. (Robinett-Arizona)
W76-02726

SALT BALANCE IN GROUNDWATER OF THE TULARE LAKE BASIN, CALIFORNIA,
For primary bibliographic entry see Field 4B.
W76-02751

WATER QUALITY MANAGEMENT PLANNING FOR URBAN RUNOFF,
URS Research Co., San Mato, Calif.
For primary bibliographic entry see Field 5D.
W76-02758

POLLUTION ABATEMENT FROM CATTLE FEEDLOTS IN NORTHEASTERN COLORADO AND NEBRASKA,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 5D.
W76-02762

LAKE CLASSIFICATION--A TROPHIC CHARACTERIZATION OF WISCONSIN LAKES,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 2H.
W76-02764

ECOLOGICALLY ACCEPTABLE METHOD OF BREAKING MINERAL OIL EMULSIONS-SUSPENSIONS,
American Cyanamid Co., Stamford, Conn. (Assignee).
E. A. Vitalis, and R. J. Chamberlain.
United States Patent 3,756,959, Issued September 4, 1973. Official Gazette of the United States Patent Office, Vol 914, No 1, p 282-283, September, 1973. 1 fig.

Descriptors: *Patents, *Emulsions, Waste water treatment, *Oil-water interfaces, Polyelectrolytes, Separation techniques, Industrial wastes, Surfactants, Water pollution control.

An ecologically acceptable method of breaking mineral oil emulsion-suspension has been patented. A variety of petroleum suspensions of the oil-in-water, water-in-oil types, particularly those containing finely divided solid suspended matter are separated into an economically valuable mineral oil fraction low in suspended solids and water and an ecologically acceptable waste water. The method employs a high molecular weight water soluble polyelectrolyte and at least one surfactant such as an alkyl sulfosuccinate. Other polyelectrolytes and surfactants are effective with a wide variety of such emulsion-suspensions, resulting in an ecologically sound separation technique. A water soluble surfactant, such as sodium isopropylnaphthalene sulfonate an oil surfactant, such as sodium di(2-ethylhexyl)sulfasuccinate, and a high molecular weight polyacrylamide of up to about 20 million molecular weight, potentiate and synergistically aid each other. The addition of heat to thin the oil layer, if it is viscous, produces particularly advantageous results. (Sandoski-FIRL)
W76-02775

FLUID RECOVERY APPARATUS,
R. T. Headrick.
Canadian Patent 928,184, Issued June 12, 1973. Patent Office Record, Vol 102, No 24, p 1962, June, 1973.

Descriptors: Waste water treatment, *Oil spills, *Industrial wastes, Equipment, *Patents, Water pollution control, Oil pollution.

An apparatus for restricting and recovering petroleum products discharged near the bottom of a body of water has been patented. A submerged collector is positioned near the discharge point of the petroleum to restict its travel, an accumulator provides remote storage of the petroleum restricted in the submerged collector, and a conduit provides for flow of the petroleum from the collector to the accumulator. (Sandoski-FIRL)
W76-02778

AERATION DIFFUSER.
French Patent 2,184,426, Applied May 16, 1972, Issued February 1, 1974. French Patents Abstracts, Vol 5, No 8, p 1, March, 1974.

Descriptors: *Waste water treatment, *Patents, *Aeration, *Diffusion, Gases, Liquid, Air, Oxygen, Water purification, Lakes, Rivers, Water pollution treatment, Equipment.
Identifiers: *Aerator.

An aeration diffuser was developed for the diffusion of a gas into a relatively large volume of liquid, particularly diffusion of air or oxygen into polluted lakes or rivers deficient in dissolved oxygen. The gas is delivered into the liquid by a small aperture to form a small bubble. The bubble is driven into the mass of liquid before its formation is complete by a flow of liquid past the aperture at a speed which is preferably less than that of the liquid past the aperture. (Merritt-FIRL)
W76-02824

OIL RECOVERY FROM OIL-CONTAMINATED WATER.
Netherlands Patent 7313-109, Applied September 24, 1973, Issued March 27, 1974. Derwent Netherlands Patents Report, Vol 5, No 15, May, 1974.

Descriptors: *Patents, *Water purification, *Oil spills, *Oceans, *Water pollution control, Equipment.
Identifiers: Oil slicks.

Purification of water, such as from oil slicks at sea, is accomplished by an apparatus with a floating body and inlet openings as well as a collecting chamber for the contaminated water. This chamber has a cover which comes partly or wholly into contact with the oil-contaminated water surface and is provided with an oil uptake device. The cover is arched and the oil uptake device may be a discharge channel or a suction unit, which is installed at the crest of the arch. (Prague-FIRL)
W76-02830

OIL RECOVERY FROM SPILLS ON WATER.
Netherlands Patent 7212-980, Applied September 26, 1972, Issued March 28, 1974. Derwent Netherlands Patents Report, Vol 5, No 15, May, 1974.

Descriptors: *Patents, *Oil, *Oil spills, Floating, Equipment, Weir, Flow, Water pollution control.
Identifiers: *Oil recovery, Floating oil skimmer.

A box-like structure, supported on detachable buoyant pontoons along each side, contain inlet equipment: an oil water separation zone; an oil collection sump; and water outlet facilities. This floating oil skimmer is easily dismantled and transported for recovering oil from water surfaces. An inlet at the open front end of the skimmer is arranged so that the skimmed water-oil mixture runs back down a slope from an adjustable lip device. The separation zone includes an adjustable weir at the bottom of the slope over which the separated oil can flow. (Prague-FIRL)
W76-02831

REMOVING OIL SUBSTANCES FROM WATER, ROADS, TOOLS AND MACHINES,
T. Or, II, and M. Watanabe.
French Patent 2,172,336, Applied February 16, 1972, Issued September 28, 1973. French Patents, Food, Disinfectants, Detergents (U50), p 4, January 17, 1974.

Descriptors: *Patents, *Water pollution control, Waste treatment, Waste water(Pollution), *Oil spills, Liquid wastes, *Oil wastes, Municipal wastes.

The preparation of a mixture of halohydracarbons containing non-ionic surfactants and their application in removing oily substances from water, roads, tools, and machines are described. The composition consists of a mixture of not less than two percent of methylene chloride, perchloroethylene, trichloroethylene, and carbon tetrachloride with 3-12 percent of the total composition, of a nonionic surfactant of the polyoxyethylene type. The composition has high emulsifying, dispersing, and stripping power, is nonflammable and can be stored safely. A homogeneous, stable, emulsified dispersion of oils is formed in (sea) water. The composition can be used to disperse oil on the sea or other water surfaces, to remove oil from roadways, or to remove oil from tools and machine. (Merritt-FIRL)
W76-02849

COALESCING OIL/WATER DISPERSIONS.
French Patent 2,176,682, Applied March 17, 1973, Issued November 2, 1973. French Patents Abstracts, Vol 5, No 1, p 1, February 7, 1974.

Descriptors: *Dispersion, *Coalescence, *Oil, *Separation techniques, Pollution abatement, Waste water treatment, *Patents.
Identifiers: Polyurethane foam.

A dispersion of a hydrocarbon oil and water is coalesced by slow passage through a bed of polyurethane foam which has been equilbrated relative to the absorption of the oleophilic liquid. The layers of oil and water are then separated at a density of 0.012-0.12 kg/cu dm, temperature of 0-100 C, and at a pressure sufficient to keep the oil in a liquid state. Applications include pollution prevention recovery of oils from residual water in oil drilling operations, separation of phenolics in wood treatments, etc. By using an equilibrated polyurethane foam a separation squeezing process for the oil is eliminated. (Merritt-FIRL)
W76-02853

REMOVING OIL SPILLS FROM WATER.
French Patent 2,177,100, Applied March 23, 1973, Issued November 2, 1973. French Patents Abstracts, Vol 5, No 1, p 2, February 7, 1974.

Descriptors: Adsorption, *Oil, Solvents, Organic compounds, Sand, Cleaning, Waste water treatment, *Patents, *Water pollution control.
Identifiers: Polystyrene foam.

A method of removing oil spills from water by absorbing the oils in pieces of foam polystyrene in which the cells have been opened by shredding is described. The polystyrene has a density of 1.4-2.0 lbs/cu ft, average cell size 1.0-3.0 mm, and is capable of adsorbing about 19 times its weight of crude oil. The oil can be subsequently recovered by treatment with a solvent (MED, MIBK, acetone, benzene, toluene, xylene, carbon tetrachloride, perchloroethylene or trichloroethylene) to dissolve the polymer. The polymer particles are preferably coated with a fire retardant before use. The method may also be used for cleaning contaminated sand, for transportation of oil and emulsified oils, and tank cleaning. (Merritt-FIRL)
W76-02854

AN ECONOMIC EVALUATION OF ALTERNATIVE SEWERAGE PRICING AND INVESTMENT PRACTICES: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
N. W. Bouwes, Sr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 431, $9.00 in paper copy, $2.25 in microfiche. Ph.D. Thesis, 1975. 246 p, 37 tab, 20 fig, 80 ref, 2 append. OWRT B-087-WIS(1). 14-31-0001-4139.

Descriptors: Water management(Applied), *Economic efficiency, *Pricing, *Investment, Economics, *Discreminatory pricing, *Water quality act, *Waste water treatment, *Income distribution, *Alternative costs, *Wisconsin, Water districts.
Identifiers: *Madison Metropolitan Sewerage District(Wis).

This study was undertaken to address the shortcomings associated with pricing and investment policies of public utilities. Prices are used primarily for financing purposes, rather than a tool for managing demand, and investment considerations do not appear to be predicated upon economic concepts. These practices may be a result of the utility's emphasis on noneconomic issues. The study objective was to make available a tool based upon the economic interactions of a system which will allow management to evaluate possible alternative management policies. Several models were developed. A theoretical model was developed from which the optimal pricing and investment conditions necessary for welfare maximization were derived. The optimal pricing scheme derived was marginal cost pricing. An applied profit oriented model was introduced, the declining-block rate model. In addition to satisfying the profit objective of private utilities this type of model was also used to demonstrate new objectives of municipally-owned utilities can be satisfied. An economic-simulation model was used to depict the Madison Metropolitan Sewerage District. Further, a conceptual model was first constructed and the empirical model was built to capture specific characteristics of the system. Two main objectives accomplished are: (1) the construction of an economic-simulation model to be used in the management decision making process; and (2) the demonstration that alternative management policies produce differences with respect to costs, revenue, demands, and incidence of financial burden.
W76-02864

COMPUTING THE BIG PICTURE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W76-02874

MINIMIZATION OF COMBINED SEWER OVERFLOWS BY LARGE-SCALE MATHEMATICAL PROGRAMMING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02878

GEOCHEMICAL IMPACT ON LEAD-MINING WASTEWATERS ON STREAMS IN SOUTHEASTERN MISSOURI,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 5C.
W76-02897

EVALUATION OF THE STRENGTH AND SEAKEEPING ABILITY OF POLLUTION CONTROL BARRIERS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
J. H. Milgram, and J. F. O'Dea.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-004 674, $7.25 in paper copy, $2.25 in microfiche. Report No CG-D-55-75, September 1974. 202 p, 9 fig, 1 tab, 17 ref, 4 append. DOT-CG-12937-A.

Descriptors: *Oil spills, *Barriers, *Model studies, *On-site investigations, Oceans, Laboratory tests, Waves(Water), Currents(Water), Structures, Structural stability, Structural behavior, Heaving, Strength, Movement, Water pollution control.
Identifiers: *Oil booms, *Oil spill cleanup, *Seakeeping.

The purpose of the work described is to provide a basis for the evaluation of arbitrary oil pollution control barriers without the need for full scale testing. For well-designed barriers the principal cause of oil leakage is droplet entrainment, which has little to do with the barrier, but depends on how the barrier is used. Since the leakage from droplet entrainment cannot be quantitatively predicted at this time (1974) and is only slightly dependent on barrier design, a barrier is best evaluated on its strength and seakeeping ability. A barrier is adequate for the task intended if it is strong enough and follows the seas well enough for it to provide a surface-piercing curtain with adequate draft and freeboard. The report gave means for making these evaluations. These were substantiated with full-scale, model and analytical results. (Humphreys-ISWS)
W76-02929

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE REAERATION OF UNIFORM STREAMS,
Mississippi Univ., University. Dept. of Civil Engineering.
C. V. Alonso, J. R. McHenry, and J-C. S. Hong.
Water Research, Vol 9, No 8, p 695-700, August 1975. 4 fig, 17 ref. OWRT A-062-MISS (3).

Descriptors: *Diffusivity, *Hydraulic properties, *Sediments, *Reaeration, *Suspended solids, *Subcritical flow, *Turbulent flow, Open channel flow, Uniform flow, Absorption, Dynamics, Froude number, Reynolds number, Sediment load, Velocity, Dissolved oxygen, Laboratory tests.

A laboratory flume was used to study the influence of suspended sediment on the surface reaeration of uniform streams. Reaeration constants were first determined in clear water flows and subsequently in flows carrying sediment in the form of a Florida quartz sand. All flows were subcritical and turbulent. The Froude number ranged from 0.85 to 0.33. The Reynolds number was greater than 33,000 in all experiments. Flow depths ranged from 0.03 to 0.107 m, and the average velocities from 0.287 to 0.875 m/s. The maximum depth-averaged sediment concentration attained was 3562 parts per million. Based on the premise that the reaeration coefficient is controlled by an effective vertical diffusivity at the free surface and by turbulent mixing beneath it, an equation was developed to predict the reaeration rate of uniform clear water flows. This equation was then modified to account for the effect of suspended sediments on the surface reaeration of uniform sediment-laden flows. The new equation indicated that the reaeration rate decreases as the average suspended sediment concentration increases. The decrease was attributed to the dynamic influence of suspended particles on the turbulent flow field. (Harmeson-ISWS)
W76-02934

LIMESTONE BARRIERS TO NEUTRALIZE ACIDIC STREAMS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
F. H. Pearson, and A. J. McDonnell.
Journal of the Environmental Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No EE3, Paper 11382, p 425-440, June 1975. 9 fig, 17 ref, 2 append. OWRT A-030-PA (4).

Descriptors: *Limestones, *Acid streams, *Neutralization, *Acid mine water, *Water pollution sources, Calcium carbonate, Carbonate rocks, Lime, Barriers, Limiting factors, Environmental effects, Ecology, Mine drainage, Water quality, Mathematical models, Model studies, Water analysis, Streams, Pollutants, Pollution abatement, Mine drainages, Coal mines, Mining, Water pollution.
Identifiers: *Limestone barriers, Crushed limestone, Rate limiting reactions.

Water samples were taken for analysis, and measurements were made to determine the effect of each installation on water quality at four prototype limestone barriers that had been constructed to neutralize acidic streams. The pH of stream water was increased by up to 3 pH units at low streamflow, to pH 7 or above. This demonstrates that limestone barriers are capable of renovating acidic streams to the point that normal aquatic life can be restored, rendering the stream water suitable for a number of uses that are otherwise precluded. A mathematical model of limestone barriers was constructed, based on hydraulic laws and on the chemical kinetics of the rate limiting reactions between crushed limestone and acidic water. Model predictions matched the observed performance of the barriers. A procedure was developed to determine the design of a barrier of crushed limestone to neutralize a given streamflow. (Henley-ISWS)

W76-02938

EVALUATION OF COPPER ACCUMULATION IN PART OF THE CALIFORNIA AQUEDUCT,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-02957

ENVIRONMENTAL CONSIDERATIONS OF SANITARY LANDFILL SITES: PART TWO,
Dames and Moore, New York.
For primary bibliographic entry see Field 5E.
W76-02988

TALES OF AN OBLIGING LADY (SPECIAL REPORT OF SOLID WASTES: LEACHATE CONTROL).
For primary bibliographic entry see Field 5E.
W76-02989

WATER GATE,
For primary bibliographic entry see Field 8C.
W76-02995

OIL-SPILL DETECTION SYSTEM,
Texaco Inc., New York. (Assignee).
For primary bibliographic entry see Field 5A.
W76-02996

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMIZATION OF WATER ALLOCATION, WASTEWATER TREATMENT, AND REUSE CONSIDERING NON-LINEAR COSTS, SEASONAL VARIATIONS, AND STOCHASTIC SUPPLIES,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-02636

PLANNING AN INPUT-OUTPUT STUDY FOR WATER RESOURCES MANAGEMENT IN NEVADA,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
S. G. Detering, J. W. Lord, and W. C. Wilson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 133, $4.00 in paper copy, $2.25 in microfiche. Report No MS 20, July 1970. 45 p, 1 fig, 2 tab, 30 ref. OWRT A-032-NEV(1).

Descriptors: *Water allocation(Policy), *Nevada, *Input-output analysis, Industries, Decision making, Economic impact, Model studies, Regional economics, Regional analysis, Planning, Water utilization, Competing uses.
Identifiers: Economic sectors.

Allocation of water resources among alternative uses has been a major problem in orderly economic growth and development in Nevada. Major questions are: (1) What are the basic relationships of economic sectors and regions in terms of generating economic activity; (2) what direct and secondary effects does change or activity within economic sectors for each region have on production, employment, and income; (3) how does demand for goods and services in each economic sector affect water requirements in each region; and (4) how can limited water supplies be allocated between competing uses so as to stimulate economic growth. The Inter-industry Input-Output model was chosen as a framework within which to analyze these problems and arrive at alternative solutions. In developing a suitable input-output matrix serious consideration should be given to developing the inter-industry accounts from secondary data (for the output structure and weighting coefficients) and the 370 sector national model (for estimating the input structure). There should be three regions, given the emphasis upon water allocation problems. Sector definition should be determined primarily by reference to specific problems and characteristics of the state's economy and resource bases. The model should include a wide range of economic management problems. (Auen-Wisconsin)
W76-02640

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W76-02714

SIMULATED BEEF FEEDLOT BEHAVIOR UNDER ALTERNATIVE WATER POLLUTION CONTROL RULES,
Ohio State Univ., Columbus. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 5G.
W76-02720

MODELS IN WATER RESOURCES,
D. H. Marks.
Chapter 4 in 'A Guide to Models in Governmental Planning and Operations,' U.S. Government Printing Office, Washington, D.C., 1974, p 103-137 (prepared for Office of Research and Development, EPA, Washington, D.C.). 4 fig, 1 tab, 12 equ, 111 ref.

Descriptors: *Water resources development, *Decision making, *Mathematical models, *Water quality, *Water pollution control, *Water allocation(Policy), Management, Analytical techniques, Simulation analysis, Statistics, Input-output analysis, Optimization, Linear programming, Dynamic programming, Equations, Investment, Water utilization, River basins, Economics.
Identifiers: *Water quantity, Public sector, Multiple objectives, Nonlinear programming, Games, Integer programming, Geometric programming, Delaware Estuary, Rio Colorado(Argentina).

A comprehensive, detailed survey is made of modeling for decision making in water resources management. The discussion is categorized into water quality and water quantity, and a wide variety of model types and problems is considered. The chapter focuses on optimal resource allocation in public sector problems where, unlike the private sector, there is no complete pricing mechanism to guide the decision or express preferences. The section on water quality is mainly concerned with pollution--waste inputs to water which preclude or damage water utilization. Being searched for are potentially better uses for residuals and more effective development policies; important is the choice of when, where, how, and how much to invest in water quality. The section on water quantity considers the physical aspects of water and its allocation to proper use. The decision maker must design investments and strategies for obtaining and transporting water in reliable quantities. A problem is diverse interest groups with diverse preferences and objectives. Costs and benefits are not in commensurate units, and the decision maker must weigh and balance many factors. Among those areas of modeling considered herein are pollution impacts on water bodies and groundwater, urbanized storm runoff, treatment technology, economic and social impacts of water pollution control, optimal taxing, regional water supply analysis, reservoir management, and investment scheduling and sequencing. Modeling techniques include simulation and dynamic and linear programming. The Delaware Estuary and Rio Colorado (Argentina) are used for illustrations. (Bell-Cornell)
W76-02722

IMPROVED STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMAL RESERVOIR OPERATION BASED ON THE ASYMPTOTIC CONVERGENCE OF BENEFIT DIFFERENCES,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W76-02729

STREAMFLOW HYDROLOGY AND SIMULATION OF THE SALT RIVER BASIN IN CENTRAL ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W76-02731

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02875

DEVELOPMENT OF REGIONAL SUPPLY FUNCTIONS AND A LEAST-COST MODEL FOR ALLOCATING WATER RESOURCES IN UTAH: A PARAMETRIC LINEAR PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
A. B. King, J. C. Anderson, C. G. Clyde, and D. H. Hoggan.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 822, $6.75 in paper copy, $2.25 in microfiche. Supp. 2 to IWR Contract Report 74-4, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, June 1972. 162 p, 60 fig, 17 tab, 68 ref, 3 appen. OWRR B-027-UTAH(3).

Descriptors: *Water resources, *Planning, *Parametric hydrology, *Linear programming, *Water transfer, Cost-benefit analysis, *Utah, Great Salt Lake, Water allocation(Policy), Water costs, Hydrologic data, Inter-basin transfers, Mathematical models, Systems analysis, Alternative planning, Optimization, Reservoirs, Water supply.
Identifiers: Shadow price, Agricultural use, Municipal and industrial use, Supply functions.

This report develops supply functions for agricultural and municipal and industrial use in ten hydrologic study units in Utah using parametric linear programming. The shadow-price of imported water to each study unit was determined to show the possible economic consequence of interbasin transfer. In general, imported water is of little or no value if water presently being evaporated from Great Salt Lake is available for diversion upstream. A statewide linear programming allocation model was developed to meet projected requirements, subject to various hydrologic constraints and limits on diversions. The primary factor affecting interbasin transfer of Colorado River water is the degree to which evaporation occurs from Great Salt Lake. (Bell-Cornell)
W76-02876

MINIMIZATION OF COMBINED SEWER OVERFLOWS BY LARGE-SCALE MATHEMATICAL PROGRAMMING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02878

ASCE URBAN WATER RESOURCES RESEARCH PROGRAM,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Program.
For primary bibliographic entry see Field 2A.
W76-02939

ON THE VALUE OF INFORMATION TO FLOOD FREQUENCY ANALYSIS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-02952

6B. Evaluation Process

DEVELOPING A CORPORATE RESPONSE TO POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass. School of Business Administration.
For primary bibliographic entry see Field 5G.
W76-02613

COASE, SOCIAL COST AND STABILITY: AN INTEGRATIVE ESSAY,
California Univ., Los Angeles. Urban Planning Programs.
For primary bibliographic entry see Field 6C.
W76-02616

MANAGEMENT OF THE BIOLOGICAL RESOURCES OF THE LAKE ONTARIO BASIN,
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.
D. M. Carlson.
Available from the National Technical Information Service Springfield Va 22161 as COM-74 10008, $9.25 in paper copy, $2.25 in microfiche. N. Y. State Sea Grant Program, Albany, Great Lakes Management Problems Series, August 1973. 281 p, 42 fig, 36 tab, 136 ref, 11 append.

Descriptors: *Lake Ontario, *Management, *Institutions, Great Lakes, Planning, United States, Canada, Watersheds(Basins), Recreation, Physical properties, Fish harvest, Land use, Human population, International commissions, Commercial fish, Sport fish, Stocking, Recreation facilities, Wildlife, Birds, New York.

A number of facets of the Lake Ontario basin are explored. The lake has the smallest surface and second smallest drainage basin, while having the greatest range of natural recreational resources of the Great Lakes. The glacial lake has an average depth of 91 m. It receives only 16% of its water budget from the Lake Ontario drainage basin. The shorelines are steep-sided clay banks with few sand beaches and frequent marshes and estuaries. The open waters of the lake show little impairment in water quality but significant changes are apparent in the tributaries and shoals. The major vegetation of the basin has been greatly altered exacerbating basin runoff and erosion. The report's remaining sections provide maps and statistics on the basin's fisheries, outdoor recreation, and wildlife. Commercial fishing in the basin has been limited, with the total 1971 Ontario and New York catch valued at only $516,000. Recreational use of the basin has been intense, and is expected to increase. Present deficiency in recreational management in the basin would be remedied through greater cooperative planning by affected governmental bodies. A number of cooperative arrangements within the basin are summarized. (Schroeder-Wisconsin)
W76-02617

USE OF WATER IN GEORGIA, 1970, WITH PROJECTIONS TO 1990,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
For primary bibliographic entry see Field 6D.
W76-02622

REGIONAL RESPONSE THROUGH PORT DEVELOPMENT: AN ECONOMIC CASE STUDY ON THE MCCLELLAN-KERR ARKANSAS RIVER PROJECT,
Arkansas Univ., Fayetteville. Bureau of Business and Economic Research.
P. H. Taylor, L. D. Belzung, and M. H. Sonstegaard.
Available from the National Technical Information Service, Springfield, Va 22161. Army Engineer Institute for Water Resources Report No IWR 74-5, August 1974. 154 p, 1 tab. DACW63-72-C-0145.

Descriptors: *Water resources development, *Economic impact, *Inland waterways, *Harbors, Industries, Regional development, Land development, Benefits, Competition, Barges, Port authorities, Comprehensive planning, Investment, Arkansas, Oklahoma.
Identifiers: *McClellan-Kerr Arkansas River Proj., Arkansas Verdigris Region, Industrial parks.

The construction of the McClellan-Kerr Arkansas River Waterway created a new resource that increased economic growth opportunities for the Arkansas-Verdigris Region and adjacent areas. This report docuements the port development response for this region. It contains a description of the present state of port and industrial park development along the Waterway, and, at the state and local level, the underlying conditions necessary for the creation of these facilities. Since the initiative for port development comes from state and local levels, the strategy and plans which evolve present important clues about potential economic impacts from the point of view of the region. The report surveys seven major port areas and thirteen individual ports. Data, in matrix form, is presented on the physical attributes of the ports, public and private investment and financing and management arrangements. It appears, that while the region may not be on the verge of surge of development, overall port development has been adequate in both location and capacity. However, the regional economic enhancement would have been greater if port planning had been started earlier, looked further ahead, and considered a wider range of alternatives. Furthermore, too much of the port and related industrial development have been delegated to local governments. (Carpenter-Wisconsin)
W76-02623

NATURAL DISASTERS: SOME EMPIRICAL AND ECONOMIC CONSIDERATIONS,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 6C.
W76-02625

THE DELAWARE ESTUARY SYSTEM, ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC EFFECTS: ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W76-02626

SOCIAL EFFECTS OF CHANGES IN USES OF BEAR LAKE, AN INTERSTATE BODY OF WATER,
Utah State Univ., Logan. Inst. for Social Science Research.
W. H. Andrews, and W. C. Dunaway.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 069, $6.00 in paper copy, $2.25 in microfiche. Research Monograph No 5, November 1975. 119 p, 33 tab, 7 fig, 53 ref, 2 append. OWRT A-023-UTAH(1). 14-31-0001-5045.

Descriptors: *Social change, Recreation, Hydroelectric power, Idaho, Utah, *Social impact, *Multiple purpose reservoirs, *Water utilization, Interstate, Water pollution.
Identifiers: *Bear Lake(Idaho-Utah).

Rapid growth of the Bear Lake area (located in Utah and Idaho) has resulted in many potential advantages and disadvantages. Economic growth, increased tax revenues, improved sewage and culinary services and more and better recreational facilities are several of the potential advantages resulting from the growth. Among the possible disadvantages are loss of fish and wildlife habitats, lessening of fthe aesthetic qualities of the area, threats to human safety through development in sensitive areas, degradation of air and water quality, shifts in the economic base and increased taxes. Different special interest groups were identified where values were found to be somewhat incompatible, thus providing for a source of conflict within this area. Differences in the opinions of local farmers, local non-farmers, and absentee property owners were discovered with respect to social values regarding development of the lake area. Alternatives to the present situation need to be developed in order to deal with the social, economic, and physical changes. Several of these alternatives are discussed in terms of their possible contributions to the resolution of the various problems.
W76-02634

PLANNING AN INPUT-OUTPUT STUDY FOR WATER RESOURCES MANAGEMENT IN NEVADA,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6A.
W76-02640

CONFERENCE ON THE MANAGEMENT OF RECREATIONAL LAKES.
Wisconsin Univ., Madison. Water Resources Center.
Available from the National Technical Information Service Springfield Va 22161 as PB-248 110, $5.50 in paper copy, $2.25 in microfiche. Held on May 17-18, 1972, Wisconsin University Center, Marinette County. 123 p. OWRT 3-046-WIS (10) and B-065-Wis (4).

Descriptors: *Management, *Recreation, *Lakes, *Wisconsin, Tourism, Economic impact, Eutrophication, Planning, Competing uses, Water quality, Land use, Land development, Organizations, Land management, Dredging, Harvesting.
Identifiers: *Lake rehabilitation, Lily Lake(Wis), Lake Noquebay(Wis), Marinette County(Wis).

Papers examining a number of recreational lake management problems were presented at a conference sponsored by the University of Wisconsin system and the Wisconsin Department of Natural Resources. Three basic problems were identified by the participants: threats to the water quality from sedimentation and over enrichment; deteriorated scenic qualities resulting from improper use and development; and increasing surface-water user conflicts as recreation demand increased. A number of physical solutions are discussed involving wastewater treatment or diversion, chemical treatment within the lake, harvesting, dilution, dredging, flushing, and bottom sealing. Managing the product of overfertilization is generally accomplished through treating excess plant growth by mechanical (harvesting), chemical (chemical application) and biologic (predation) means. New innovative institutional approaches involving individual, collective and governmental alternatives to protect and enhance recreational lakes are also discussed. Examples drawn from Wisconsin lakes' experiences are presented to illustrate a number of the physical and institutional solutions discussed. (See W76-02642 thru W76-02652) (Schroeder-Wisconsin)
W76-02641

WATER-RELATED RECREATION: PLANNING FOR MANAGEMENT,
Office of Water Resources Research.
J. S. Gladwell.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 5-24, 20 ref.

Descriptors: *Recreation demand, *Comprehensive planning, *Management, Social needs, Competing uses, Sport fish, Projections, Public rights, Jurisdiction, Legal aspects, Government finance, Use rates, Riparion rights, Remedies, Social aspects, Attitudes, Behavior, Cost-benefit ratio. *Wisconsin.

Water quality, accessibility, and conflicts in use influence the demand of water-related recreation. Recreation planners must understand the relation of the hydrologic cycle to recreational water use, geographical distribution and availability of water resources, recreation desires of user groups, ecological relationships between the water resource and user, and economic factors. Sociological aspects and the governmental role in planning, developing, and managing water bodies and correcting or adjusting existing conditions are discussed. Forecasts must be carefully prepared in order to incorporate future demands or conditions. Water quality surveillance must be continuous, established quality standards enforced, and federal grant programs for waste treatment facilities increased to maintain suitable water quality for recreation. Establishment of water quality criteria for aquatic life is very complex. Knowledge about changes that have occurred should help decide proper corrective measures, increase awareness of data limitations, and help plan alternatives. Economic evaluations aid in achieving optimal recreational water resources use. Outdoor recreation problems are related to urban problems Lake development plans should consider urban area proximity, probable nature and intensity of recreational use, recreational attributes of specific lakes, and extent of governmental involvement. Government plans must be goal-oriented, environmentally sound, and publicly acceptable. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02642

RECREATIONAL LAKES...WHAT ARE THE PROBLEMS,
Wisconsin Univ., Green Bay. Recreational Resource Planning.
R. B. Ditton.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 25-30.

Descriptors: *Competing uses, *Recreation demand, *Decision making, *Management, *Attitudes, Water quality, Eutrophication, Bodies of water, Tourism, *Wisconsin, Water users, Social values, Lake shores, Aquatic weeds, Rights-of-way, Aesthetics, Public access, Regulation.
Identifiers: Recreation lake problems, Lake Noquebay(Wis), Lake rehabilitation, Shoreland development.

Recreation and tourism is the second largest industry in Wisconsin with water as the key element. Socio-economic determinants and extensive water resources in Wisconsin have caused a demand-supply conflict. Two categories of problems have been recognized: physical lake problems and water surface use problems. Growth of nuisance weeds and organisms due to increased sedimentation and nutrient input threaten aesthetic values, cause health and safety problems, and affect fish populations. Judgement of water quality by the public, biologists, water chemists, or limnologists varies. Water level manipulation and landfills also affect recreational values of lakes. Conflicts in water surface use frequently occur between boat fishing, water skiing, pleasure boating, and swimming between water and shoreland uses. Surveys can help clarify water use problems. Studies of Lake Noquebay, Wisconsin, are discussed. In addition to zoning, the extent of public access is important in resolving water surface conflicts. Resolution of conflicts must be based on an equitable balance between the public's right to use water for recreation and the property owner. The public is uncertain as to which agency is responsible for solving these problems. Comprehensive watershed planning can optimize recreational lake values and can prevent many of these problems. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02643

A LAKE--HOW DOES IT BEHAVE,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-02644

UPGRADING LAKES--LAKE RENEWAL AND MANAGEMENT TECHNIQUES,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
For primary bibliographic entry see Field 5G.
W76-02645

UPGRADING LAKES--LAND-WATER RELATIONSHIPS,
Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
For primary bibliographic entry see Field 5G.
W76-02646

AQUATIC VEGETATION HARVESTING,
Dane County Dept. of Public Works, Madison, Wis.
For primary bibliographic entry see Field 4A.
W76-02647

ALTERNATIVES TO PROTECT AND ENHANCE LAKES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-02648

AN ENVIRONMENTAL LAND PLANNING APPROACH--CASE STUDY, LILY LAKE PROJECT,
Wisconsin Univ., Madison. Environmental Awareness Center.
M. A. Sharkawy.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 83-93.

Descriptors: *Comprehensive planning, *Land development, *Recreation, *Environment, Design, Social aspects, Psychological aspects, Sites, Political aspects, Geology, Administration, Topography, Management, Legal aspects, Climate, Landscaping, Architecture, Locating, Marketing, Engineering, Economics, *Wisconsin, Systems analysis, Lakes, Land management, Optimum development plans.
Identifiers: *Lily Lake Project(Wis), Case study, Green corridors, Cluster housing.

An environmental land planning process is illustrated utilizing the Lily Lake project. The project is part of a demonstration effort by the Upper Great Lakes Regional Commission to show alternative development plans and consists of a 3,600 acre tract including two lakes with natural shoreland and attractive meandering stretch of the Lily River. The planning approach detailed utilizes a multidisciplinary team to analyze both the cultural and natural milieus and their interrelationships. The team began by gathering market data on relevant demand and supply variables. Market segments and merchandising targets are also identified. Simultaneously, the process of inventory and site data collection is begun. Next, functional, and suitability, and ecological analyses are performed. The former analyzes the compatibility of various design elements (housing and recreation) with each other. The latter identifies and displays the physical elements, and the plant and wildlife ecology and their interrelationship for each site, and suggests the suitability of each for development. The final task under the planning process is to incorporate each of the analyses into an optimal general site plan utilizing a synthesis concept. Two syntheses approaches-- the cluster and green corridor concepts--are utilized in the planning model. The need for cash flow analysis within the planning process is also discussed. (See also W76-02641) (Schroeder-Wisconsin)
W76-02649

COOPERATION WITH THE SOIL CONSERVATION SERVICE,
Soil Conservation Service, Antigo, Wis. Resource Conservation and Development.
For primary bibliographic entry see Field 6E.
W76-02650

THE FACTS OF LIFE,
Wisconsin Univ. Center System-Marinette County, Bay Shore. Dept. of Economics.
J. E. Berry, and T. W. Thompson.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 101-108.

Descriptors: *Recreation, *Lakes, *Cost sharing, Lake shores, Dredging, Lake sediments, Costs, Biocontrol, Chemcontrol, Aquatic weed control, Harvesting, *Wisconsin, Land development, Cooperatives, Local governments, Economic impact.
Identifiers: *Lake Noquebay(Wis), *Lake rehabilitation, Marinette County(Wis), Lakeshore development.

The harmful effects of unplanned lakeshore development as it affects lakes and particularly Lake Noquebay, Marinette County, Wisconsin, are described. Filling and dredging low land created organic muck in which variable water milfoil thrives. Effectiveness, cost, target specificity, legal feasibility and political attractiveness, and side effects of four milfoil control alternatives are discussed. Biological control by carp such as the white amur, is deleterious to recreational fishing. Dredging is costly (approximately $1 million without disposal costs) and may cause high turbidity. Chemcontrol by herbicide applications would cost about $30,548 annually, but swimming and fishing might be halted for several days. The best method would be mechanical weed harvesting, costing about $22,190 annually plus equipment costs of $30-50,000. The lake is valued over $1 million per year to the local economy. Tourism generates $11.5 million a year in direct sales in Marinette County, with Lake Noquebay responsible for a large portion of these sales. Much of this income would be lost and recreational opportunities foregone if the lake's recreation potential is eliminated. Township governments and property owners' associations must assume their share of financial responsibility before requesting additional funding. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02651

LAKES AND WISCONSIN'S FUTURE,
Wisconsin Office of the Governor, Madison. Lieutenent Governor.
For primary bibliographic entry see Field 6E.
W76-02652

LEGAL-POLITICAL HISTORY OF WATER RESOURCE DEVELOPMENT IN THE UPPER COLORADO RIVER BASIN,
California Univ., Santa Barbara. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W76-02669

EVALUATING COSTS FOR PORT DISTRIBUTION SYSTEMS,
Board of Engineers for Rivers and Harbors, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-02716

ANALYSIS AND MANAGEMENT OF WATER DISTRIBUTION SYSTEMS,
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 4A.
W76-02718

MULTIOBJECTIVE PLANNING OF WATER AND LAND RESOURCES,
H. A. Steele.
In 'Economics and Decision Making for Environmental Quality,' (Ch 5), J. R. Conner and E. Loehman, Eds., Gainesville University Press of Florida, 1974, p 99-122, 1 fig, 4 tab, 33 ref.

Descriptors: *Water resources, *Planning, *Water policy, Economics, Standards, Land resources, Alternative planning, Decision making, U. S. Water Resources Council, Multiple projects.
Identifiers: *Multiple objectives.

Described are efforts by governmental agencies to develop new standards for planning for water and land resource development. Considered are former planning procudures, new directions in planning, special task force recommendations, planning of objectives--including national economic development, environmental quality enhancement, social well-being, and regional development--, benefits and costs, systems of accounts, and cost allocation and reimbursement. Discussed are the principles and standards developed by the Water Resources Council and how these principles evolved. A widespread problem has been that not enough information was reported on alternative plans for resource development to provide information on the trade-offs between monetary and nonmonetary values. The Council now recommends that several alternative plans be formulated and the differences among alternative plans illustrated in an account sheet format. A recommended plan can then be chosen on an evaluation of trade-offs. The Council has recognized that evaluation requires a broader judgmental basis and more public participation. (Bell-Cornel)
W76-02721

MODELS IN WATER RESOURCES,
For primary bibliographic entry see Field 6A.
W76-02722

STATE WATER PLANNING,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6E.
W76-02735

THE ARIZONA RESOURCES INFORMATION SYSTEM - 1975,
Arizona Resources Information System, Phoenix. Dept. of Revenue.
C. C. Winikka.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 5-11, 2 fig.

Descriptors: *Arizona, *Natural resources, *Information retrieval, *Remote sensing, *Research and development, Data processing, Land use, Water utilization, Land classification.
Identifiers: Arizona Resources Information System.

The Arizona Resources Information System is designed to serve on going needs of the people of Arizona through state, federal and local agencies. The various land and water environmental organizations use the resource system for their research. The ARIS has prepared Arizona orthopotoquads, developed early land use classification systems, and evaluated electronic data processing graphical and analytical systems and many information systems. (McLachlan-Arizona)
W76-02736

FORMULATION OF NONSTRUCTURAL FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W76-02879

RESERVOIR PROJECT ENVIRONMENTAL STUDY,
Iowa State Water Resources Research Inst., Ames.
M. D. Dougal, and K. L. Dueker.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 101, No HY9, Proceedings paper No 11578, p 1257-1272, September 1975. 3 fig, 2 tab, 10 ref.

Descriptors: *Water resources development, *Reservoirs, *Environmental engineering, *Projects, Planning, River basins, Hydraulics, Methodology, Management, Decision making, *Iowa.
Identifiers: *Ames reservoir project(Iowa).

The research-management principles and methods used in conducting an interdisciplinary environmental resources study are summarized as an aid in complying with the federal NEPA requirements. A case study of the proposed Ames reservoir project in Iowa is used to illustrate the application of study methods, organization of the project study and review, cross-discipline coordination, problems encountered in achieving results, and application of these results in final decision making. Results achieved by the five study categories also are presented. The five functional categories include: (1) reservoir site and stream system as resource entities; (2) social and economic impact of the reservoir; (3) recreation and related open-space uses and needs; (4) physical relationship with the agricultural sector of the environment; and (5) physical relationships with the urban sector of the environment. For example, a principal element of Category number 1, the reservoir site study, was the description and evaluation of intrinsic properties. A computer-designed landscape overview model was adapted from previous work at Harvard University; this impact analysis permitted identification, storage and correlation of detailed natural resource information on a grid basis. Keys to good management are adequate project leadership, a well defined scope of work, adequate data and resource information, functional study categories as manageable tasks, ability to meet time schedules, anf formulation and publication of results. The Ames Reservoir Environmental Study illustrates how an environmental study can be formulated, staffed, and conducted. (Bell-Cornell)
W76-02880

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COASE, SOCIAL COST AND STABILITY: AN INTEGRATIVE ESSAY,
California Univ., Los Angeles. Urban Planning Programs.
J. Weld.
Natural Resources Journal, Vol 13, No 4, p 595-613, 1973. 2 fig, 14 ref.

Descriptors: *Resource allocation, *Econometrics, *Usufructuary right, Environment, Pollutants, Welfare(Economics), Trespass, Legal aspects.
Identifiers: *Nuisance externalities, *Property rights, *Coase theorem.

The economic value of normative legal judgements, especially those permitting dynamic stability of socio-econimic behavior has been a neglected issue in the evolving debate over the Coase theorem. Under the Coase theorem, Z conclusions are drawn. First, assuming the costless operational assumptions of perfect competition, positive economics would be indifferent as to the liability rule. Second, invoking the principle of Occam's razor, the simpler system of market solutions is preferrable to the complex systems of courts. But the latter conclusion precludes considerations of the dynamic properties of the two liability rules. The legal process invokes a number of stabilizing effects. The resulting social stability implies as normatives legal policies which transcent the operation of time and history, pluralistic policies which protect individual and neighborhood property interests from avoidable distrubance and a revealed set of societal interests which reference definition of private and social cost. A comparison indicates that, assuming both rules yield identical allocations, a legal solution appears more dynamically efficient. One additional question is addressed: How does legal and economic power, and the choice of the social starting point affect the dynamics of resource allocation, wealth distribution, locational clustering and socio-economic behavior. (Schroeder-Wisconsin)
W76-02616

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: PETROLEUM REFINING INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W76-02618

ECONOMIC DISINCENTIVES FOR POLLUTION CONTROL: LEGAL, POLITICAL, AND ADMINISTRATIVE DIMENSIONS,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02619

CAPITAL INVESTMENT FOR WATER POLLUTION CONTROL AT THE STATE AND LOCAL LEVEL,
Frumkin (Norman), Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02620

NATURAL DISASTERS: SOME EMPIRICAL AND ECONOMIC CONSIDERATIONS,
National Bureau of Standards, Washington, D.C.
G. T. Sav.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-11719, $4.50 in paper copy, $2.25 in microfiche. Report No NBSIR 74-473, February 1974. 72 p, 20 fig, 23 tab, 23 ref, 1 append.

Descriptors: *Acts of God, *Economic impact, *Protection, *Cost-benefit analysis, Floods, Earthquakes, Tornadoes, Tropical cyclones, Decision making, Economic feasibility, Building codes, Warning systems, Optimization, Disasters.

The costs incurred in excess of $1 million, casualties, and psychological effects, from hurricanes, floods, earthquakes and tordadoes are examined with the view of determining the optimal levels of protection by applying benefit-cost analysis. Property damages resulting from hurricanes were: 1950-1954 $802 million, 1955-1959 $539 million, 1960-1964 $1576 million and 1965-1969 $3091 million. Flood damages were: $1680 million, $1695 million, $1151 million, and $2520 million, respectively. Comparative figures are also given for earthquakes and tornadoes. Floods caused the greatest amount of total damage and more total property damages than the other three disasters. When the primary concern in disaster protection is to reduce the dollar value of property damages and the destruction of dwellings, then initial efforts might be directed toward mitigating the effects of hurricanes and floods. If the concern is for reducing the loss of lives, then it may be more effective to invest in techniques for the mitigation of losses due to tornadoes. The conclusions, however, are based only on assessment of the potential benefits (reduction in losses) that might be realized by protecting against adverse effects of disasters, with no examination of the costs of protection. (Auen-Wisconsin)
W76-02625

ECONOMICS OF SOIL TREATMENTS IN THE UPPER COLORADO,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 4D.
W76-02674

EVALUATING COSTS FOR PORT DISTRIBUTION SYSTEMS,
Board of Engineers for Rivers and Harbors, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-02716

HIGHWAY AND SEWER IMPACTS ON URBAN DEVELOPMENT,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W76-02717

ANALYSIS AND MANAGEMENT OF WATER DISTRIBUTION SYSTEMS,
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 4A.
W76-02718

SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: RESEARCH RESULTS,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W76-02757

OXYGEN PULP BLEACHING CUTS WASTE EFFLUENTS,
Kaymer, Inc., Glens Falls, N.Y.
For primary bibliographic entry see Field 5D.
W76-02805

AN ECONOMIC EVALUATION OF ALTERNATIVE SEWERAGE PRICING AND INVESTMENT PRACTICES: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-02864

DEVELOPMENT OF REGIONAL SUPPLY FUNCTIONS AND A LEAST-COST MODEL FOR ALLOCATING WATER RESOURCES IN UTAH: A PARAMETRIC LINEAR PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W76-02876

6D. Water Demand

ENERGY DEMAND AND ITS EFFECT ON THE ENVIRONMENT,
Rand Corp., Santa Monica, Calif.
D. N. Morris.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A002 123, $4.00 in paper copy, $2.25 in microfiche. Rand Paper 5048, July 1973. 28 p, 13 fig.

Descriptors: *Energy, *Demand, *California, *Environmental effects, *Conservation, Fossil fuels, Air pollution, Electric power production, Land use, Water resources, Thermal pollution, Nuclear powerplants, Hazards, Projections, Radioactive waste disposal, Solar radiation, Insulation.
Identifiers: Commercial electricity usage, Residential electricity usage, Industrial electricity usage.

Two broad solutions to meeting the increased, and increasing, demands for energy are considered in the light of their environmental impacts in California. (1) Developing new supplies of energy fast enough to meet demands aggravates environmental pollution as present anti-pollution technology is inadequate and costly. Supplies of fossil fuels are finite and growth in conventional electricity production will have an adverse effect on rivers and coastlines. Expansion of nuclear energy incurs both short and long-term risks. (2) Ways of slowing increases in demand for energy so that supply can adequately meet it are considered: the use of natural gas an alternative to electricity; conservation methods--through consumer education, financial incentives and disincentives, and restrictive policies; and alternative sources energy--specifically solar. The economic and social implications of conservation and alternative energy sources are discussed. (Carpenter-Wisconsin)
W76-02621

USE OF WATER IN GEORGIA, 1970, WITH PROJECTIONS TO 1990,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
R. F. Carter, and A. M. F. Johnson.
Hydrologic Report 2, 1974. 80 p, 9 fig, 7 tab, 23 ref.

Descriptors: *Water utilization, *Georgia, *Projections, Water demand, Consumptive use, Estimating, Forecasting, Industrial water, Domestic water, Irrigation water.

Water use in Georgia during 1970 averaged about 5560 mgd for public supply--domestic, commercial, and industrial; rural domestic, livestock, and irrigation; self-supplied industrial, and thermoelectric power. Hydroelectric power used about 52,000 mgd. Consumptive use of water in 1970 averaged 318 mgd. Thermoelectric power plants used 3940 mgd, the most rapidly increasing water use in terms of actual amount used and in percent of increase. Projections of water use for 1990 indicate increases of 100% for public water supply systems, 18% for all rural uses, and 75% for self-supplied industries. Use of cooling water at thermoelectric powerplants is not projected to increase because of expected differences in the mode of operation at new plants. Water used by hydroelectric plants is expected to increase by 100% but much of this increase will result from water reuse through pumped-storage operation. Projections for 1990 total 6565 mgd, based on a 120% increase for irrigation and livestock and self-supplied industrial use of about 175% of 1970 consumption. No increase is expected in cooling water use by thermoelectric plants; water used by hydroelectric plants will only double, due to use of recirculated water. The consumptive use of water projections to 1990 will total 760 mgd. (Auen-Wisconsin)
W76-02622

REGIONAL RESPONSE THROUGH PORT DEVELOPMENT: AN ECONOMIC CASE STUDY ON THE MCCLELLAN-KERR ARKANSAS RIVER PROJECT,
Arkansas Univ., Fayetteville. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6B.
W76-02623

OPTIMIZATION OF WATER ALLOCATION, WASTEWATER TREATMENT, AND REUSE CONSIDERING NON-LINEAR COSTS, SEASONAL VARIATIONS, AND STOCHASTIC SUPPLIES,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W76-02636

PLANNING AN INPUT-OUTPUT STUDY FOR WATER RESOURCES MANAGEMENT IN NEVADA,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6A.
W76-02640

WATER-RELATED RECREATION: PLANNING FOR MANAGEMENT,
Office of Water Resources Research.
For primary bibliographic entry see Field 6B.
W76-02642

RECREATIONAL LAKES...WHAT ARE THE PROBLEMS,
Wisconsin Univ., Green Bay. Recreational Resource Planning.
For primary bibliographic entry see Field 6B.
W76-02643

6E. Water Law and Institutions

MANAGEMENT OF THE BIOLOGICAL RESOURCES OF THE LAKE ONTARIO BASIN,
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W76-02617

ECONOMIC DISINCENTIVES FOR POLLUTION CONTROL: LEGAL, POLITICAL, AND ADMINISTRATIVE DIMENSIONS,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02619

CAPITAL INVESTMENT FOR WATER POLLUTION CONTROL AT THE STATE AND LOCAL LEVEL,
Frumkin (Norman), Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-02620

SOME INSTITUTIONAL CONSTRAINTS TO COASTAL ZONE MANAGEMENT: A CASE STUDY OF HAWAII,
Hawaii Univ., Honolulu. Coll. of Tropical Agriculture.
C. Gopalakrishnan, and J. Rutka.
American Journal of Economics and Sociology, Vol 33, No 3, p 225-232, 1974. 1 tab, 8 ref. NOAA SG 235243.

Descriptors: *Institutional constraints, *Public rights, *Hawaii, *Seashores, Management, Beaches, Jurisdiction, Zoning.

The problems hampering Hawaii's coastal zone management are primarily the result of some rather unique institutional structures, such as (1) the oligopolistic nature of shoreline ownership; (2) conflicts and controversies among shoreline interests, such as private owners, the environmental and conservation groups, and government agencies; (3) jurisdictional overlapping and lack of interagency coordination; and (4) absence of effective institutional mechanisms to ascertain public interest and incorporate public benefits into coastal zone legislation. Nearly 67% of the total shoreline and 77% of the sandy shoreline is owned between the military and private owners, resulting in an effective shoreline for public use of roughly 16%. Viable mechanisms to articulate and incorporate public interest have been all but absent but there are indications that the public is at long last making a concerted effort to reassert itself. Despite their overriding importance, institutional factors have received scant attention in formulating the state's coastal zone policy. The need for drastically revamping Hawaii's archaic infrastraucture to delineate a sound and efficient coastal zone management strategy is apparent. (Auen-Wisconsin)
W76-02624

SOCIAL EFFECTS OF CHANGES IN USES OF BEAR LAKE, AN INTERSTATE BODY OF WATER,
Utah State Univ., Logan. Inst. for Social Science Research.
For primary bibliographic entry see Field 6B.
W76-02634

COOPERATION WITH THE SOIL CONSERVATION SERVICE,
Soil Conservation Service, Antigo, Wis. Resource Conservation and Development.
R. Stats.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 94-100, 6 fig.

Descriptors: *Governmental interrelations, *Land development, Soil surveys, Topography, Watersheds(Basins), Drainage, Alternative planning, Land use, Limiting factors, Soil-water movement, *Wisconsin, Percolating water, Cooperation.
Identifiers: *Lake Noquebay(Wis), *Soil Conservation Service, Marinette County(Wis).

The Soil Conservation Service working through Soil and Water Conservation Districts provides basic soil and water information through planning and application assistance to individuals, groups, and governmental units. The Service supplies basic soil inventories, soil survey maps are checked, some topographical and on-site engineering studies may be made, and the watershed and possibly the surrounding land and drainage area studied. The owners' needs, desires, and goals are then analyzed; possible alternatives are provided for a given situation; then decisions made and recorded. Soil surveys provide background information for determining best land-use patterns and to help develop plans. The Soil Conservation Service discusses limitations for soil uses such as housing, roads, trees, crops, sewage systems, foundations, and erosion potentials, but does not say that a particular soil can or cannot be used for a specific use. A 7700 acre area near Lake Noquebay was mapped; soil survey photographs were prepared showing soil types and slopes, and limitations on soil use were described. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02650

LAKES AND WISCONSIN'S FUTURE,
Wisconsin Office of the Governor, Madison. Lieutenent Governor.
M. Schreiber.
In: Conference on the Management of Recreational Lakes, May 17-18, 1972, Wisconsin University Center, Marinette County, p 109-112.

Descriptors: *Legislation, *Lakes, *Wisconsin, *State governments, Political constraints, Air pollution, Water pollution control, Water resources, Institutions, Legal aspects, Pollution abatement, Monitoring, Effluents, Water quality control.

The efforts of the Wisconsin State Legislature to abate, control, and eliminate water pollution are emphasized by the Lieutenant Governor. A measure was enacted to limit mercury discharges. A bill transfering the pesticide review board from the Department of Agriculture to the Department of Natural Resources (DNR) and change its function to a chemical substances review board was not considered by the Senate. A 1971-3 executive budget provision requires industrial polluters to submit pollution reports to the DNR and to pay monitoring fees based on quantity and quality of effluent discharged. Funds were provided for the DNR Environmental Protection Division to establish water and air quality monitoring stations and make un-announced on-site inspection of pollution sources. The DNR considers environmental quality when issuing permits to alter waterways or construct dams; environmental impact reports on effects on water quality can be required. The Wisconsin Environmental Policy Act requires environmental impact evaluation of major actions or legislation by state and local governments. Bills prohibiting untreated domestic sewage discharge into waters, declaring all pollution a public nuisance, permitting anyone to prosecute without having to prove specific damages, limiting use of phosphates and harmful detergent chemicals, and placing deposits on non-returnable bottles were not passed. (See also W76-02641) (Buchanan-Davidson--Wisconsin)
W76-02652

LEGAL-POLITICAL HISTORY OF WATER RESOURCE DEVELOPMENT IN THE UPPER COLORADO RIVER BASIN,
California Univ., Santa Barbara. Dept. of Political Science.
D. E. Mann, G. D. Weatherford, and P. Nichols.
Lake Powell Research Project Bullentin No 4, September, 1974. 53 p, 1 fig, 2 tab, 106 ref.

Descriptors: *Colorado River Basin, *Colorado River, *Water law, *Water resources development, *Planning, Colorado River Compact, Mexican Water Treaty, Legal aspects, Water rights, Legislation, Water policy, Water quality, Governments, Conservation, Water management(Applied).
Identifiers: *Colorado River Storage Project Act.

The first part of this study is a descriptive summary of the legal history surrounding passage of the Colorado River Storage Project Act of 1956, while the second part approaches those historical events analytically from the perspective of political science. The major political and legal decisions emanating from the Colorado River Compact of 1922 and resulting in the 1956 Act are identified. Five general themes are evident in history: (1) the developmental needs of the Upper Basin, (2) the legal constraints of the 1922 Compact, (3) the economic wisdom of the Colorado River Storage Project, (4) the conservation value of Dinosaur National Momument, and (5) the engineering feasibility and geologic effects of the project. The dynamics of the political bargaining, including the nature of some of the major tradeoffs are described. The persistence of distributive politics, in the face of increasing pressure for a more regulatory mode of decision-making, is discussed in the context of some of the current problems such as water quality of the river. Finally, several unresolved issues of public policy concerning Colorado River management are posed. (Robinett-Arizona)
W76-02669

MULTIOBJECTIVE PLANNING OF WATER AND LAND RESOURCES,
For primary bibliographic entry see Field 6B.
W76-02721

STATE WATER PLANNING,
Arizona Water Commission, Phoenix.
W. E. Steiner.
In: Vol 5: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1975 Meetings of the Arizona Section, American Water Resources Association and the Hydrology Section, Arizona Academy of Science, April 11-12, 1975, Tempe, Arizona, p 1-4.

Descriptors: *Water resources, *Arizona, *Water policy, *Planning, *Water management(Applied), Desalination, State governments, Water importing, Water distribution(Applied), Legislation, Weather modification, Colorado River.
Identifiers: *Central Arizona Project.

From the establishment of the Arizona Resources Board in 1928 until the Arizona Water Commission was formed in 1971, no state water plan was developed. Since 1971, the longest and most intensive planning studies have been concerned with allocation of Colorado River water through the Central Arizona Project. Future plans involve desalting sea water, weather modification, importation of water, etc. The Arizona State Water Plan ultimately will be a plan of management of Arizona's limited water resources. Water plans and economic and environmental impact evaluations are scheduled for completion by July, 1977. (McLachlan-Arizona)
W76-02735

6F. Nonstructural Alternatives

UPGRADING LAKES--LAKE RENEWAL AND MANAGEMENT TECHNIQUES,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
For primary bibliographic entry see Field 5G.
W76-02645

UPGRADING LAKES--LAND-WATER RELATIONSHIPS,
Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
For primary bibliographic entry see Field 5G.
W76-02646

FORMULATION OF NONSTRUCTURAL FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James.
Water Resources Bulletin, American Water Resources Association, Vol 11, No 4, p 688-705, August 1975. 1 fig, 23 tab, 3 ref.

Descriptors: *Flood control, *Non-structural alternatives, Evaluation, Assessment, Flood plains, Decision making, Community development, Costs, Benefits, Surveys, Planning, Management.

A balanced flood program combines structural measures to contain flood waters with nonstructural means of limiting flood plain development and increasing flood proofing of flood plain buildings. The design of nonstructural measures requires determination of which aspects of a local situation can cause a particular program to function or fail. Lists are provided of four physical factors, six community factors, and eight individual factors that have been found to be most influential in determining whether a given means can be implemented in a given setting and whether, if it were, the desired responses would be induced. The applicability of the physical, community, and individual factors to assessing the effectiveness of ten implementation means is evaluated. For example, the community factor of widespread 'recognition of the flood problem' by community residents is believed to be a determining influence on how effective the community will be in distributing flood warnings (one of the ten implementation means) in ways to which people will respond. Results of a case study in which the physical, community, and economic factors were evaluated for the flood plains of three small creeks in metropolitan Atlanta are given. Individual flood plain occupants have a major role in making the land use and building decisions that constitute nonstructural measures. (Bell-Cornell)
W76-02879

6G. Ecologic Impact Of Water Development

ENGINEERING DESIGN HANDBOOK, ENVIRONMENTAL SERIES, PART ONE, BASIC ENVIRONMENTAL CONCEPTS.
Army Materiel Command, Alexandria, Va.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 999, $7.75 in paper copy, $2.25 in microfiche. AMC Pamphlet No. 706-115, July 31, 1974 (Supersedes AMCP 706-115, October 1969). 225 p, 56 fig, 48 tab, 165 ref.

Descriptors: *Publications, *Environment, *Military aspects, *Engineering, Topography, Climates, Climatology, Arid climates, Humid climates, Wet climates, Glaciers, Ice, Snow, Precipitation(Atmospheric), Environmental effects, Biology, Microorganisms, Vegetation, Erosion, Corrosion, Corrosion control, Rots, Decomposing organic matter, Air pollution, Solar radiation, Testing, Model studies, Materials.
Identifiers: *Macrobiological organisms, Pests.

This handbook, a revision of an earlier document, is the first in a series on the nature and effects of environmental phenomena. Part One introduced the importance of the environment; i.e., its effects, the factors of the environment, the complex combinations of the environment that occur, quantitative environmental concepts, and the testing of materiel and simulation of the environment. The categorization of materiel as it exists and relates to environmental effects also was discussed. Introduced in a general and qualitative manner were those factors that are to be treated quantitatively in the succeeding volumes. The revision augmented the treatment of those factors and climates, a combination of factors discussed only briefly in the original handbook. The chapter on materiel categorization was added. Chapter headings are: (1) The Environment Faced By The Military, (2) Importance of Environment, (3) Natural Environmental Factors, (4) Induced Environmental Factors, (5) Combined Environmental Factors-Climates, (6) Quantitative Environmental Concepts, (7) Testing And Simulation, and (8) Materiel Categorization. (Humphreys-ISWS)
W76-02550

A SIMULATION MODEL FOR STUDYING EFFECTS OF POLLUTION AND FRESHWATER INFLOW ON SECONDARY PRODUCTIVITY IN A ECOSYSTEM,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 5C.
W76-02567

ENERGY DEMAND AND ITS EFFECT ON THE ENVIRONMENT,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 6D.
W76-02621

THE DELAWARE ESTUARY SYSTEM, ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC EFFECTS: ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W76-02626

MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 4C.
W76-02865

RESERVOIR PROJECT ENVIRONMENTAL STUDY,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 6B.
W76-02880

MODELS AND THE DECISION MAKING PROCESS: THE HUDSON RIVER POWER PLANT CASE,
Brookhaven National Lab., Upton, N.Y. Dept. of Biology.
C. A. S. Hall.
Available from the National Technical Information Service, Springfield, Va 22161, as BNL-19203, $4.00 in paper copy, $2.25 in microfiche. Report No BNL 19203, (1974). 19 p, 4 fig.

Descriptors: *Powerplants, *Estuaries, *Fisheries, *Hudson River, Striped bass, Life history studies, Trash racks, Entrainment, Cooling water, Mortality, *Model studies, Cooling towers, Decision making, Estuaries, *New York.
Identifiers: Consolidated Edison.

Directly or under contract with Consolidated Edison data was collected and modeled to determine the effects of power plants on the Hudson River estuarine environment, with particular emphasis on striped bass. The life cycle of the fish is described. Power plants were found to have a substantail effect on fish mortality, particularly by impingement on trash screens and by entrainment during cooling water uptake. Based on the model results, the Atomic Energy Commission has required that all future Hudson River plants under their jurisdiction would have to be equipped with wet cooling towers and that cooling towers would have to be backfilled on existing plants. The problems of subjectivity, objectivity, and bias of modelers as they relate to decision making are discussed, particularly in view of the fact that social and policy aspects were not included in the models; no evaluation was made of the benefits and losses of fisheries as opposed to more electricity. However, the fish issue gave a lever to conservationists during hearings as the more vague issues of fuel depletion, regional air pollution, and additional industrial expansion made possible by the availability of electricity are less easily argued. (Auen-Wisconsin)
W76-02987

7. RESOURCES DATA

7A. Network Design

NUMERICAL ERRORS IN WATER PROFILE COMPUTATION,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-02688

STUDY OF TIME-LAPSE PROCESSING FOR DYNAMIC HYDROLOGIC CONDITIONS,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 4A.
W76-02713

THE ARIZONA RESOURCES INFORMATION SYSTEM - 1975,
Arizona Resources Information System, Phoenix. Dept. of Revenue.
For primary bibliographic entry see Field 6B.
W76-02736

7B. Data Acquisition

A REVIEW OF THE POTENTIAL APPLICATIONS OF REMOTE SENSING TECHNIQUES TO HYDROGEOLOGICAL STUDIES IN AUSTRALIA,
Newcastle Univ. (Australia). Dept. of Physics.
C. D. Ellyett, and D. A. Pratt.
Australian Water Resources Council, (Camberra), Technical Paper No 13, 1975. 147 p, 55 fig, 3 tab, 72 ref, append.

Descriptors: *Remote sensing, *Hydrogeology, *Australia, *Reviews, Infrared radiation, Radar, Aircraft, Electromagnetic waves, Radiation, Electronic equipment, Soil moisture, Groundwater, Geology.
Identifiers: Side looking airborne radar, Low frequency electromagnetic methods.

This review examined the relationship between remote sensing measurements and the physical properties of hydrogeological environments. Research into the hydrogeological applications of many of these remote sensing methods is still in its infancy and virtually no method can currently be considered a proven tool for hydrogeological investigations, as distinct from surface water studies. The visible and thermal infrared methods in combination will provide a powerful tool for the study of near surface soil moisture over large areas. The thermal infrared method has been successfully applied to the detection of groundwater discharge into bodies of open water, and in certain circumstances can be used to estimate the discharge rate. Some physical property information relevant to hydrogeological environments can be obtained from side looking airborne radar (SLAR) surveys, although the cost of such surveys would usually be considered prohibitive. Recent advances with a monopulse radar system have shown considerable promise for the detection of shallow groundwater tables and the estimation of soil moisture content. The low frequency electromagnetic methods provide greater ground penetration than radar systems and are suitable for the investigation of near surface aquifers and recharge zones. The aeromagnetic method may be used indirectly in certain circumstances for the study of hydrogeological environments. (Sims-ISWS)
W76-02534

MEASUREMENT AND ANALYSIS OF TEMPORAL VARIATIONS OF SALINITY IN SHALLOW WATER,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.

W76-02542

EVALUATION OF AN INFRARED OIL FILM MONITOR,
Wright and Wright, Inc., Newton Center, Mass.
For primary bibliographic entry see Field 5A.
W76-02544

THE DESIGN AND PERFORMANCE OF A 6-CUP ANEMOMETER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Mechanical Engineering.
D. Lindley.
Journal of Applied Meteorology, Vol 14, No 6, p 1135-1145, September 1975. 11 fig, 1 tab, 25 ref.

Descriptors: *Anemometers, *Winds, *Instrumentation, Velocity, Measurement, Testing, Evaluation, Equipment, Design criteria, Engineering, Meteorology.
Identifiers: Wind tunnel tests.

An investigation was made into the design and performance of 'staggered' 6-cup anemometers. It was found that the optimum cup arm radius to cup radius ratio (R/r) for both these and 3-cup anemometers is indeterminate; the value to be used in any design only depends on the speed of cup rotation required for a given wind speed. The calibrations for such instruments were linear at all settings of R/r. Distance constants as low as 0.5 m were obtained at an optimum setting of cup wheel spacing to cup radius (L/r) of 2.5 for wheels of all polystyrene construction. Tests of 6-cup, 3-cup, and propeller anemometers in a sinusoidally fluctuating air stream demonstrated that the percentage overestimation of the mean wind speed varied from 3% (for the Gill 4-blade propeller) to 11.5% for the 3-cup (lipless) anemometer of all polystyrene construction at a gust amplitude of 0.5. The 6-cup anemometer had a marked superiority in these tests over the 3-cup anemometers and also had lower starting speeds. (Sims-ISWS)
W76-02553

IMPROVEMENTS IN PHENOLDISULFONIC ACID METHOD FOR DETERMINATION OF NOX,
Pratt and Whitney Aircraft, East Hartford, Conn.
For primary bibliographic entry see Field 5A.
W76-02557

OSCILLATOR CIRCUIT FOR PROVIDING A CONDUCTIVITY RATIO OF SEA WATER,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
L. C. Murdock.
U.S. Patent No 3,906,353, 6 p, 11 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 938, No 3, p 1371, September 16, 1975.

Descriptors: *Patents, *Salinity, *Water properties, *Conductivity, *Electrical conductance, Electrical equipment.
Identifiers: Oscillators, Electrical circuits.

An instrument is described which utilizes two conductivity cells, one conductivity cell being adapted for measuring the conductivity of the water environment acting on the cell, and a second cell which is a standard cell for measuring the conductivity of a standard sample of water of known salinity. The ratio of the conductivity measurements of the two cells is by international agreement an indication of salinity. An output signal is obtained which is proportional to the conductivity ratio and this output signal must be conveyed to a remote location such as by a wire link communication. The oscillator of the invention includes a first circuit which provides a first output signal indicative of a desired measured parameter. This measured parameter is conductivity ratio. A second circuit arrangement provides a second output signal which varies linearly with time. An output amplifier which includes first and second inputs receives the respective first and second output signals and is operable to provide an output signal whose value switches between relatively positive and negative output values as determined by its input signals. The output signal from the amplifier has a period or frequency which is directly proportional to the measured parameter and independent of power supply voltage. The output signal from the amplifier is fed back to serve as the input signals to the first and second circuits. (Sinha-OEIS)
W76-02594

A DIGITIZED RADAR FOR PRECIPITATION MEASUREMENTS AND APPLICATIONS TO HYDROLOGY,
Kansas State Univ., Manhattan. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2B.
W76-02635

AN IMPROVED RECORDING GAGE FOR BLOWING SNOW,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Watershed Lab.
R. L. Jairell.
Water Resources Research, Vol 11, No 5, p 674-680, October 1975. 8 fig, 5 ref.

Descriptors: *Snow, *Precipitation gages, Design data, Air, Winds, Snow cover, Installation, Flow control, Instrumentation.
Identifiers: *Recording gage, *Blowing snow, Snow trap, Particle counters, Snow fence, Belfort weighing gage, Air sample.

Experience gained from an earlier gage (Tabler and Jairell, 1971) led to significant innovations that have greatly improved the operation of a simple, inexpensive instrument for recording blowing snow. The most important improvement was the efficient turntable design which allowed the precipitation gage to be independent of the snow trap, the result having been a high-quality chart record. Principal advantages included simplicity, inexpensiveness, and suitability for operation in remote areas that lack electrical power. The relationship of the snow caught by this gage to snow accumulation behind a snow fence should be studied further as a means of calibration. It appeared that the gage could be used to estimate total snow transport during drifting events. (Roberts-ISWS)
W76-02700

MEASUREMENT OF INTERNAL WAVES OF TIDAL FREQUENCY NEAR A CONTINENTAL BOUNDARY,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environment Lab.
For primary bibliographic entry see Field 2L.
W76-02710

DEVELOPMENT AND TESTING OF A LASER RAIN GAGE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2B.
W76-02752

ASSESSING SOIL MOISTURE REMOTELY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W76-02753

ASSESSING BARE SOIL EVAPORATION VIA SURFACE TEMPERATURE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2D.
W76-02754

MEASURING SNOW COVER FROM ERTS IMAGERY ON THE BLACK RIVER BASIN,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2C.
W76-02756

WATER SAMPLING DEVICE.
For primary bibliographic entry see Field 5A.
W76-02818

WATER QUALITY MEASURING APPARATUS.
For primary bibliographic entry see Field 5A.
W76-02826

LIQUID POLLUTION MEASUREMENT.
For primary bibliographic entry see Field 5A.
W76-02857

A STUDY OF MINNESOTA FORESTS AND LAKES USING DATA FROM EARTH RESOURCES TECHNOLOGY SATELLITES, TWENTY-FOUR MONTH PROGRESS REPORT.
Minnesota Univ., Minneapolis. Space Sciences Center.
For primary bibliographic entry see Field 4A.
W76-02901

FOREST DISEASE DETECTION AND CONTROL,
Minnesota Univ., St. Paul. Dept. of Plant Pathology.
For primary bibliographic entry see Field 2I.
W76-02902

EVAULATION OF WATER QUALITY BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., St. Paul. Dept. of Forest Biology.
For primary bibliographic entry see Field 5A.
W76-02903

FOREST VEGETATION CLASSIFICATION AND MANAGEMENT,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 4A.
W76-02904

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-02905

USE OF ERTS IMAGERY TO ASSIST IN SNOW-MELT FLOOD PREDICTION,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 2C.
W76-02906

REMOTE SENSING APPLICATIONS TO HYDROLOGY IN MINNESOTA,
Minnesota Univ., Minneapolis, Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-02907

REMOTE SENSING IN LAKE SUPERIOR STUDIES,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2H.
W76-02908

GEOPHYSICAL STUDIES OF FLOATING ICE BY REMOTE SENSING,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2C.
W76-02954

DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2J.
W76-02963

SOIL MOSITURE DETECTION DEVICE,
For primary bibliographic entry see Field 2G.
W76-02997

7C. Evaluation, Processing and Publication

BACKGROUND INFORMATION FOR PROPOSED NEW SOURCE PERFORMANCE STANDARDS: ASPHALT CONCRETE PLANTS, PETROLEUM REFINERIES, STORAGE VESSELS, SECONDARY LEAD SMELTERS AND REFINERIES, BRASS OR BRONZE INGOT PRODUCTION PLANTS, IRON AND STEEL PLANTS, SEWAGE TREATMENT PLANTS: VOLUME 2, APPENDIX: SUMMARIES OF TEST DATA.
Environmental Protection Agency, Research Triangle Park, N.C. Office of Air and Water Programs; and Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
For primary bibliographic entry see Field 5G.
W76-02543

USE OF WATER IN GEORGIA, 1970, WITH PROJECTIONS TO 1990,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
For primary bibliographic entry see Field 6D.
W76-02622

LOWER SHEYENNE RIVER BASIN WATER - LAND - PEOPLE.
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 5A.
W76-02627

PHYSICAL FRAMEWORK OF GROUND WATER OCCURRENCE AND MOVEMENT IN GLACIAL DEPOSITS IN CENTRAL NORTH DAKOTA,
North Dakota Univ., Grant Forks. Dept. of Geology.
J. H. Ulmer, and D. K. Sackreiter.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 074, $2.50 in paper copy, $2.25 in microfiche. Research Project Technical Completion Report, No WI-221-028-74, December 1974, 1 map. (N. D. Geological Survey Report of Investigation 51). OWRT A-037-NDAK(1). 14-31-0001-3834.

Descriptors: *Groundwater movement, *Glacial sediments, *North Dakota, Stratigraphy, Glaciation, Cenozoic era, Pleistocene epoch.
Identifiers: Cenozoic stratigraphy(ND), Charging Eagle Formation(ND), Medicine Hill Formation(ND), Horseshoe Valley Formation(ND), Pleistocene glacial sediment, Snow School Formation(ND), Oahe Formation(ND).

The late Cenozoic stratigraphy of central North Dakota is best exposed along the nearly continuous, 20-meter-high, vertical bluffs of Lake Sakakawea in the Missouri River trench. The following lithostratigraphic units (in ascending order) can be correlated for many tens of kilometers along the bluffs: (1) Charging Eagle Formation (late Tertiary or early Pleistocene sediment of a northeast-flowing ancestor of the Missouri River); (2) lower Medicine Hill Formation (Pleistocene sediment of northeast-flowing ancestor of the Missouri River and of meltwater streams and lakes); (3) upper Medicine Hill Formation (Pleistocene glacial sediment); (4) lower Horseshoe Valley Formation (Pleistocene sediment of northeast-flowing ancestor of the Missouri River and of melt-water streams and lakes); (5) upper Horseshoe Valley Formation (Pleistocene glacial sediment); (6) lower Snow School Formation (Pleistocene sediment of a northeast-flowing ancestor of the Missouri River and of melt-water streams and lakes); (7) middle Snow School Formation (Pleistocene glacial sediment); (8) upper Snow School Formation (late Pleistocene sediment of a glacier that advanced tens of kilometers southwest of the present position of the Missouri River); and, (9) Oahe Formation, with four members recognizable throughout the area (late Wisconsinan and Holocene wind-blown silt; characteristics of members are controlled by changes in hillslope stability resulting from climatic changes). These stratigraphic units provide the physical framework for groundwater movement in much of central North Dakota.
W76-02631

GEOTHERMAL INVESTIGATIONS IN IDAHO: PART 2. AN EVALUATION OF THERMAL WATER IN THE BRUNEAU-GRAND VIEW AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 4B.
W76-02655

WATER RESOURCES DATA FOR NEBRASKA, 1974: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lincoln, Nebr.
R. A. Engberg, and L. R. Petri.
Data Report, 1975. 252 p, 1 fig, 4 tab, 20 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Nebraska, Basic data collections, Chemical analysis, Physical properties, Streamflow, Sediment transport, Water temperature, Biological properties, Sampling, Sites.

Water-resources data for the 1974 water year for Nebraska include records of data for the chemical and physical characteristics of surface and groundwater. Data on the quality or surface water (chemical, biological, temperature, and sediment) were collected from designated sampling sites once daily, weekly, monthly, or less frequently. Records of chemical analyses are given for 175 groundwater sites. Locations of the surface water sampling stations are shown on a map. (Woodard-USGS)
W76-02656

ANALYSIS OF THREE YEARS OF COMPLETE-FIELD TEMPERATURE DATA FROM DIFFERENT SITES OF HEATED SURFACE DISCHARGES INTO LAKE MICHIGAN,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W76-02683

RESULTS OF SEA SURFACE MAPPING IN THE PERU UPWELLING SYSTEM,
San Francisco State Univ., Calif. School of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-02698

COMPUTER SIMULATION OF THE SNOWMELT AND SOIL THERMAL REGIME AT BARROW, ALASKA,
Michigan Univ., Ann Arbor. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W76-02703

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W76-02714

AN ANALYSIS OF BORDER IRRIGATION FLOW,
Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 3F.
W76-02728

IMPROVED STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMAL RESERVOIR OPERATION BASED ON THE ASYMPTOTIC CONVERGENCE OF BENEFIT DIFFERENCES,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W76-02729

AERIAL SNOWPACK MAPPING,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 2C.
W76-02755

DEVELOPMENT OF REGIONAL SUPPLY FUNCTIONS AND A LEAST-COST MODEL FOR ALLOCATING WATER RESOURCES IN UTAH: A PARAMETRIC LINEAR PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W76-02876

MINIMIZATION OF COMBINED SEWER OVERFLOWS BY LARGE-SCALE MATHEMATICAL PROGRAMMING,
Colorado State Univ. Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02878

SELECTION OF THRESHOLD VALUES IN GEOCHEMICAL DATA USING PROBABILITY GRAPHS,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2K.
W76-02892

FOREST VEGETATION CLASSIFICATION AND MANAGEMENT,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 4A.
W76-02904

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-02905

A STOCHASTIC RAINFALL MODEL AND STATISTICAL ANALYSIS OF HYDROLOGIC FACTORS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-02928

REMOVAL OF PERIODICITIES BY DIFFERENCING AND MONTHLY MEAN SUBTRACTION,
Purdue Univ., Lafayette, Ind. Schools of Engineering.
For primary bibliographic entry see Field 2A.
W76-02944

WATER RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NEVADA, 1974-75,
Geological Survey, Las Vegas, Nev.
For primary bibliographic entry see Field 4B.
W76-02958

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
J. C. Fisher, and H. D. King, Jr.
Open-file report, September 1975. 264 p, 19 fig, 15 tab, 4 ref.

Descriptors: *Urban hydrology, *Rainfall-runoff relationships, *Surface waters, *Streamflow, *Texas, Basic data collections, Hydrologic data, Storm runoff, Hydrographs, Mass curves, Reservoirs.
Identifiers: *Houston area(Tex), Reservoir content.

This report contains rainfall and runoff data collected during the 1973 water year for drainage basins in the Houston, Texas metropolitan area. The information will be useful in determining the extent to which progressive urbanization will affect the yield and mode of occurrence of storm runoff. Detailed rainfall-runoff computations, including hydrographs and mass curves, are presented for nine storm periods during the 1973 water year. The most significant storm event of the year occured in June. Widespread showers of moderate to low intensities fell June 5-10. On June 11, 12, and 13 widespread, moderate to high intensity rains fell on the entire study area. A three day total rainfall average of 10 inches (254 mm), together with high antecedent soil moisture and moderate to high rainfall intensities, produced high rainfall-runoff ratios. Runoff data are based on discharge measurements and stage records at 14 continuous-record stream-gaging stations, 7 partial-record stream-gaging stations, and 2 reservoir-content stations. (Woodard-USGS)
W76-02961

DOCUMENTATION OF FINITE-DIFFERENCE MODEL FOR SIMULATION OF THREE-DIMENSIONAL GROUND-WATER FLOW,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-02962

GROUND-WATER LEVELS IN WYOMING, 1974,
Geological Survey, Lakewood, Colo.
W. C. Ballance, and P. B. Freudenthal.
Open-file report (basic-data report), August 1975. 186 p, 21 fig, 3 ref.

Descriptors: *Groundwater resources, *Basic data collections, *Water wells, *Water level fluctuations, *Wyoming, Well data, Hydrography, Observation wells, Pumping, Irrigation, Networks.

Groundwater levels are measured periodically throughout Wyoming in an observation-well network by the U. S. Geological Survey in cooperation with the Wyoming State Engineer and the city of Cheyenne. Water-level measurements provide information on the status of the groundwater supply and facilitate prediction of trends in water levels, which indicate change in groundwater storage. During 1974, about 1,500 measurements were made. Net water-level changes were computed, using about 235 measurements made during the first 4 months of 1974 and 1975. Tables of well history, highest and lowest water levels, net changes, and hydrographs for most wells are included in this report. (Woodard-USGS)
W76-02964

SOME LIMNOLOGICAL ASPECTS OF 20 SELECTED LAKES IN EAGAN AND APPLE VALLEY, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 2H.
W76-02966

8. ENGINEERING WORKS

8A. Structures

SMALL-CRAFT HARBORS: DESIGN, CONSTRUCTION, AND OPERATION,
Moffatt and Nichol, Long Beach, Calif.
J. W. Dunham, and A. A. Finn.
Available from the National Technical Information Service, Springfield, Va. 22161. United States Army Coastal Engineering Research Center Report SR-2, December 1974. 375 p, 175 fig, 5 tab, 37 ref, 11 append. DACW 72-72-C-0011.

Descriptors: *Harbors, *Marinas, *Recreation facilities, Jetties, Breakwaters, Port authorities, Coastal structures, Shore protection, Docks, Piers, Piles(Foundations), Engineering structures, Environmental effects, Planning, Operation and maintenance.
Identifiers: *Harbor facilities, Fueling systems, Drydocks.

Analytical data and design standards and procedures were presented for use in the development of small-craft harbors and launching facilities under a wide variety of conditions applicable to a broad spectrum of geographic locations. Environmental impact and governmental control aspects were discussed. Procedures for determining project feasibility and possible sources of governmental assistance were presented. Harbor operations and administration were reviewed. Several case histories of harbors were included. (Sims-ISWS)
W76-02548

FREEZEUP PROCESSES ON ARCTIC BEACHES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W76-02551

DESIGN AND CONSTRUCTION OF HYDRAULIC STRUCTURES ON PERMAFROST,
A. I. Gromov.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A003 317, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 416, September 1974. 15 p, 5 fig. Translated from Trudy Lengidroproyekta. Vesesoyuznyy Proyektno-Izyskat' el'skiy i Nauchno-Issledovatel'kyiy Institut, No 8, p 165-175, 1968.

Descriptors: *Cold weather construction, *Dams, *Powerplants, *Hydroloelectric plants, *Permafrost, *Hydraulic structures, Cold regions, Polar regions, Construction, Concrete construction, Concrete dams, Rockfill dams, Winter.
Identifiers: *Mamakanskaya hydroelectric plant(USSR). *USSR.

The construction standards currently available for planning and production of hydraulic structures on permafrost were explored briefly. The diversity of natural conditions and the poor state of study of their features requires a fairly careful approach to a determination of the possibility of employing permafrost soils as a foundation for structures with reference to the pressures and nature of structures. It is necessary to formulate special technical conditions for the planning of each building project in the Far North due to the incompleteness of present observations. Several possible conditions affecting the building of hydraulic structures were dealt with. The construction of the Mamakanskaya Hydroelectric plant proved the effectiveness, economy, and engineering feasability of utilizing precaste ferroconcrete under the conditions of a harsh climate. (Sims-ISWS)
W76-02913

8B. Hydraulics

FILLING AND EMPTYING SYSTEM FOR ICE HARBOR LOCK, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
L. Z. Perkins.
Available from the National Technical Information Service, Springfield Va 22161 as ADA-000 312, $5.00 in paper copy, $2.25 in microfiche. Technical Report No 32-1, May 1973. 82 p, 11 fig, 22 plates, 19 tab, 1 ref.

Descriptors: *Locks, *Model studies, *Hydraulic models, Hydraulics, Hydraulic structures, Engineering structures, Dams, Navigation, Valves, Flow control, Laboratory tests, Culverts, Structures, Hydraulic engineering, Washington.
Identifiers: *Ice Harbon Dam(Wash), *Snake River(Wash), Filling and emptying systems.

The Ice Harbor lock, 86 ft wide by 675 ft long, has a split-lateral hydraulic system and a maximum lift of 103 ft. The hydraulic system, lock chamber, outlet basin, and portions of approach channels were reproduced in a 1:25-scale model. Design details of the lateral culverts were studied in a 1:16-scale model. Pressures downstream from the right filling valve and in 90-degree bends of the original emptying culverts were lower and hawser forces on barge tows were higher than desired. Pressures in the right culvert were increased by moving the roof transition upstream to the filling valve. Pressures in the 90-degree bends were satisfactory when expanding sections just upstream from the outlet basin were eliminated and the outlet basin was changed to direct flow downstream. Hawser forces were reduced by redesigning the upstream sill block. The adopted lock chamber and filling system were tested for lifts between 80 and 112 ft. Filling times were 10.2, 11.4, and 11.7 min for lifts of 80, 103, and 112 ft, respectively. Corresponding emptying times were 12.9, 14.1, and 14.7 min. Overall lock coefficients were 0.84 (filling) and 0.60 (emptying). Typical maximum hawser forces during the above lifts were 2.3, 3.6, and 4.4 tons; transverse forces were under 2.5 tons. Seventeen-ft-wide roofs on the lateral culverts did not reduce large random hawser forces. The possibility of vortex action over the intake manifolds was slight when the intake ports were 10 ft upstream from the upper sill block and almost none when the distance was increased to 31.08 ft. (final design). (Sims-ISWS)
W76-02536

SCOUR AT BRIDGE WATERWAYS--A REVIEW,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
A. G. Anderson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 685, $4.00 in paper copy, $2.25 in microfiche. Report for Federal Highway Administration, Washington, D.C., October 1974. 29 p, 6 fig, 11 ref. FHWA P.O. 4-1-0159.

Descriptors: *Scour, *Bridges, *Piers, *Dimensional analysis, *Erosion, Laboratory tests, Shear.
Identifiers: *Field data, *Transport rate.

A brief investigation is described of scour around bridg piers with emphasis on the following areas: (1) analysis of various formulations for scour around bridge piers, (2) ongoing Federal Highway Administration field studies of scour around bridge piers, and (3) recommendations for future research. It was pointed out that practically all of the presently available scour formulas can be reduced to a common set of dimensionless parameters. When compared the formulas differed widely in form and magnitude. There is a serious lack of data to cover a wider range of parameters in order to discover trends. It was recommended that these gaps be filled by research and that other areas relative to bridge openings be examined in order to clarigy the areas in which more study, both laboratory and field, is needed. (Bhowmik-ISWS)
W76-02684

HORIZONTAL SPREAD OF WASTEWATER FIELD OVER CALM OCEAN SURFACE,
Montgomery Inc., Pasadena, Calif. M. James.
For primary bibliographic entry see Field 5B.
W76-02687

NUMERICAL ERRORS IN WATER PROFILE COMPUTATION,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
E. McBean, and F. Perkins.
Journal of Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY11, Proceedings Paper 11694, p 1389-1403, November 1975. 4 fig, 4 tab, 6 ref, 2 append.

Descriptors: *Flow profiles, *Gradually varied flow, Computer programs, Hydraulics, Numerical analysis, Open channels, Open channel flow.
Identifiers: *Water profiles, *Numerical errors, Numerical integration, Open channel hydraulics.

The numerically-generated errors created during water surface profile computation were examined. Theoretical equations were developed to serve as bounds on the actual errors that are introduced during the computation. The analysis also provided criteria which may be used in the rational selection of the calculation increment. Experimental results demonstrated that in most engineering application the effect of numerical errors on the computed profile will be considerably smaller than that due to data uncertainty. There are cases, however, when numerical error generation is significant, but these appear to be predictable through the error bound equations. (Lee-ISWS)
W76-02688

THE APPLICATION OF STEP-DRAWDOWN PUMPING TESTS FOR DETERMINING WELL LOSSES IN CONSOLIDATED ROCK AQUIFERS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W76-02747

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-02875

INCIPIENT MOTION AND SEDIMENT TRANSPORT,
Illinois State Water Survey, Urbana; and Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 2J.
W76-02877

VELOCITY--BED-FORM--TEXTURE PATTERNS OF MEANDER BENDS IN THE LOWER WABASH RIVER OF ILLINOIS AND INDIANA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W76-02919

HIERARCHICAL ATTRIBUTES AND A UNIFYING MODEL OF BED FORMS COMPOSED OF COHESIONLESS MATERIAL AND PRODUCED BY SHEARING FLOW,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W76-02920

THE INFLUENCE OF SUSPENDED SEDIMENT ON THE REAERATION OF UNIFORM STREAMS,
Mississippi Univ., University. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-02934

TRANSIENT FLOW ROUTING IN CHANNEL NETWORKS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
E. F. Wood, B. M. Harley, and F. E. Perkins.
Water Resources Research, Vol. 11, No 3, p 423-430, June 1975. 14 fig, 2 tab, 6 ref. OWRT C-1708(3159)(2) and (C-3301)(3716) and C-1495(1988)(3).

Descriptors: *Simulation analysis, *Mathematical models, *Unsteady flow, *Networks, Hydraulic models, Channels, Hydraulics, Routing, Rivers, Flow.
Identifiers: *Finite difference, *James River(Va), *Cork Harbor(Ireland), *Bayamon River(Puerto Rico), Matrices.

The formulation of a mathematical model to predict transient flows in hydraulic networks was presented. The network formulation consisted of breaking the network up into a series of connected reaches; reducing the finite difference equations for each reach into two 'reach' equations; forming an exterior matrix consisting of the reach equations, external boundary conditions, and interior compatibility conditions; solving the external matrix for the end values of discharge and water surface elevation for all reaches; and back-substituting for all interior values. Examples presented include the James River estuary model (24 nodes and 26 reaches), the Cork Harbor, Ireland, estuary (13-reach double-looped network), and a Rio Bayamon basin, Puerto Rico. Results were very satisfactory when they were compared to known data. The structure of the network made it possible to incorporate special features such as bridges, dams, and locks into the simulation analysis. (Lardner-ISWS)
W76-02941

DEMONSTRATION OF A METHODOLOGY FOR DREDGED MATERIAL RECLAMATION AND DRAINAGE,
Dames and Moore, San Francisco, Calif.
For primary bibliographic entry see Field 5E.
W76-02945

INVESTIGATION OF MATHEMATICAL MODELS FOR THE PHYSICAL FATE PREDICTION OF DREDGED MATERIAL,
Army Engineer Waterwasys Experiment Station, Vicksburg, Miss. Office of Dredged Material Research.
For primary bibliographic entry see Field 5B.
W76-02946

PREDICTED EFFECTS OF PUMPING ON LOWERING THE WATER TABLE IN THE TWIN, CRYSTAL, RYAN LAKES-HIGHWAY 100 AREA, HENNEPIN COUNTRY, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4C.
W76-02965

8C. Hydraulic Machinery

FILLING AND EMPTYING SYSTEM FOR ICE HARBOR LOCK, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-02536

METHOD AND APPARATUS FOR CONTROLLING WATER FLOW FROM AN IMPOUNDED BODY OF WATER,
Fluid Dynamics Proprietory Ltd., Cape Town (South Africa).
For primary bibliographic entry see Field 4A.
W76-02595

CISTERN.
Australian Patent 444,625, Applied March 11, 1970, Issued January 31, 1974. Official Journal of Patents, Trade Marks, and Designs, Vol 44, No 3, p 259, January 31, 1974.

Descriptors: *Patents, *Cisterns, *Design data, Weir, Valves, Floats, Operation, Conduits, Waste water treatment.

A cistern is described which has walls and a base forming a container, a weir, or a dividing wall, joining walls at its ends and extending upwardly from the base to divide the cistern into two parts. There is a ball valve part and a float part which connect above the weir. The upper edge of the weir or dividing wall is below the upper edges of the walls. A pair of float operated valves are carried by the cistern and positioned above the ball valve part of connected to mains supply. An outlet conduit extends downwardly from the first pair of valves and passes through the cistern base. A by pass tube places the conduit in fluid flow connection near the base with the float part of the cistern and constitutes an ejector inlet conduit. A short outlet conduits depending from the second pair of valves, each valve has a valve operating arm pivoted to it with floats attached to it. The floats are positioned in the float part of the cistern. (Merritt-FIRL)
W76-02821

WATER GATE,
R. L. Halpern, and C. L. Skiles.
U.S. Patent No. 3,916,628, 3 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 80, November 4, 1975.

Descriptors: *Patents, *Water levels, *Water level fluctuations, *Water pollution control, Engineering structures, *Gates, Bodies of water.
Identifiers: *Floating gates.

To permit a pollution-free connection of a polluted with an unpolluted body of water or an estuary or streams, a pair of gates which, except for a limited time interval, confine the pollutants to the polluted body of water and prevent their dissemination to or intrusion into connected bodies of water which would otherwise be pollution free. A floating gate in its closed position has its ends placed in recesses on each side of the water way. The gate has a controlling device to slide one-half of it into an open position. The gate is maintained in a level position during its traverse from closed to open position. The gate has compartments which can be

filled with fluid to maintain it in a flotation position relative to the surface of the water in the waterway. The gate is free to rise and fall as the level of water changes. (Sinha-OEIS)
W76-02995

PROPELLING PIPE SUPPORT TOWER FOR PIVOT IRRIGATION SYSTEMS,
For primary bibliographic entry see Field 3F.
W76-02999

8D. Soil Mechanics

STABILIZATION OF SOIL AND AGGREGATE MATERIALS FOR FORWARD AREA OPERATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
R. W. Grau.
Available from the National Technical Information Service, Springfield, Va 22161. AD-A001 521 $4.50 in paper copy, $2.25 in microfiche. Instruction Report S-74-3, September 1974. 51 p, 16 fig, 3 tab, 4 ref.

Descriptors: *Soil stabilization, *Soil physical properties, *Military aspects, Soil aggregates, Soil compaction, Surface sealing, Soil types, Soil stability, Soil strength, Soil structure, Soil sealants, Waterproofing, Roads, Airports, Mechanical properties, Construction, Soil mechanics.

The purpose of this instruction report was to provide information for the use of native soil and aggregate materials for the expedient construction of roads, airfields, heliports, and storage areas in forward areas of a theater of operations. Procedures were presented to aid the military engineer in evaluation or identification of the soil and in selecting methods of improving the existing physical properties of the native materials so that they will be suitable for construction purposes. Also, the procedures would help the engineer select the type and quantity of additive required if chemical stabilization is to be used. The methods considered in this report for improving the physical properties of low-quality materials were mechanical and chemical stabilization and waterproofing techniques. Information was also given to help in the selection of the appropriate construction equipment for a particular operation. Detailed construction procedures were outlined for the various types of stabilization. (Sims-ISWS)
W76-02681

FILTRATION OF DRAINAGE ELEMENT,
For primary bibliographic entry see Field 4A.
W76-02838

OPTIMAL HEIGHT OF A DAM FOR PRESERVATION OF BEARING GROUND IN A FROZEN STATE,
Yu. G. Kulikov.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A003 318, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 451, January 1975. 6 p, 3 fig. Translated from Transportnoye Stroitel'stvo, No. 10, p 35-37, October 1968.

Descriptors: *Earth dams, *Frozen ground, *Thawing, Permafrost, Cold weather construction, Cold regions, Dams, Beds, Dam foundations, Frozen soils, Vegetation, Solar radiation, Albedo, Evaporation, Heat transfer, Model studies, Mathematical models.
Identifiers: *USSR.

In the construction of an earth bed in regions where permafrost ground occurs, instances of the thawing of the frozen base are found under the fills of slight height as a result of changes in the heat exchange condition (distruptions of vegetative cover, conditions of evaporation, insolation, condensation, albedo of surface) and also as a result of the effect exerted by the surface and groundwater. Under such conditions, for finding the amount of settling of the fills during the planning of an earth bed, it is necessary to calculate the thawing depth of the permafrost base or even to determine the height to fill at which the permafrost ground does not thaw. The thawing depth of a frozen base under a fill made of thawed ground is greater than under a fill formed of frozen ground. (Sims-ISWS)
W76-02910

FREEZING OF AN EARTH DAM FROM THE DRY SLOPE SIDE,
A. A. Tsvid.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 216, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 430, December 1974. 19 p, 9 fig, 1 tab, 6 ref. Translated from Dal'nevostochnyy Nauchno-Issledo-vatel'skiy Institut po Stroitel'stuv, Sbornik Nauchnykh Rabot, Vol I, p 94-104, 1961.

Descriptors: *Earth dams, *Permafrost, *Freezing, Frozen ground, Cold weather construction, Cold regions, Dams, Dam construction, Temperature, Insulation, Thermal insulation, Ventilation.
Identifiers: *USSR, Freezing rates.

The article discussed measures for increasing an earth dam's freezing rate by natural cold through the dry-slope side both during pouring the fill and during operation of the frozen dam. Among these measures were included: (1) removal of snow from the dam surface; (2) covering the surface of the dry slope with insulation during summer; (3) installation of a permanent screen over the dam; and (4) freezing of ice reserves on the dry slope's surface, with tunnels ventilated in winter. (Sims-ISWS)
W76-02914

VARIATION OF GEOCRYOLOGICAL CONDITIONS BENEATH DAMS DEPENDING ON UPPER TEMPERATURE LIMITS,
S. A. Zamolotchikova.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 209, $3.50 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 457, February 1975. 15 p, 3 fig, 1 tab, 15 ref. Translated from Merzlotnyze Issledovaniyi, No 8, p 186-198, 1968.

Descriptors: *Embankments, *Permafrost, *Cold weather construction, Highways, Railroads, Roadbanks, Cold regions, Excavation, Earthworks, Construction, Road construction, Earth dams, Soil mechanics, Thawing, Freezing, Cryology.
Identifiers: *USSR.

In the northern regions of the USSR, construction of railroads and highways is expanding on a broad front. In the building of roads, a grouping of structures is being developed, among which the earth bed (fills, excavations, etc.) is one of the main items. A compilation of forecasts indicating the variation in permafrost ground under fills and in excavations has rarely been made by calculation until now, because in each case, it is necessary to solve a two- or three-dimensional problem regarding the freeze-thaw cycles in soils. A prediction of the variation in permafrost conditions beneath fills can now be formulated based on the results of interdisciplinary permafrost surveying. This report discussed one of the first attempts at analyzing the influence of cutoff temperatures on the variation in permafrost ground under a fill. (Sims-ISWS)
W76-02915

BUILDING DAMS IN PERMAFROST REGIONS,
N. G. Semenov.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 319, $3.25 in paper copy, $2.25 in microfiche. Army CRREL Draft Translation 452, November 1974. 5 p, 3 fig, 3 ref. Translated from Gidrotekhnicheskoye Stroitel'stvo, No 9, p 14-15, 1967.

Descriptors: *Earth dams, *Permafrost, *Freezing, Cold weather construction, Cold regions, Dams, Frozen ground, Construction, Dam construction, Seepage, Civil engineering, Structures.
Identifiers: *USSR.

By observations, the possibility has been confirmed of erecting dams in permafrost regions on loose soils containing much ice. It was shown that the complete freezing of a dam's body with the aid of blowing cold air through the dam (according to a special system built into the dam) occurs quite intensively. The procedures involved in planning and building the dam in a permafrost region were detailed. (Sims-ISWS)
W76-02925

8E. Rock Mechanics and Geology

DESIGN AND CONSTRUCTION OF HYDRAULIC STRUCTURES ON PERMAFROST,
For primary bibliographic entry see Field 8A.
W76-02913

8F. Concrete

SURVEY OF CORROSION OF PRESTRESSING STEEL IN CONCRETE WATER-RETAINING STRUCTURES,
For primary bibliographic entry see Field 8G.
W76-02535

CONCRETE FOR TUNNEL LINERS: BEHAVIOR OF STEEL FIBER REINFORCED CONCRETE UNDER COMBINED LOADS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
K. S. Herring, and C. E. Kesler.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 382, $5.00 in paper copy, $2.25 in microfiche. Report UILU-ENG-74-2025, August 1974. 71 p, 23 fig, 9 tab, 10 ref. DOT FR 30022.

Descriptors: *Reinforced concrete, *Tunnel linings, *Mechanical properties, Reinforcement, Laboratory tests, Compressive strength, Poisson ratio, Elasticity(Mechanical), Failure(Mechanics), Stress, Materials testing, Strength of materials, Cements, Concretes, Engineering structures, Linings.
Identifiers: *Steel fiber reinforcement, Quick setting cements.

The study was undertaken to determine the behavior of a steel fiber reinforced concrete member subjected to combined compressive and flexural loads. In addition, information was obtained on the tensile stress-strain relationship, the modulus of elasticity in compression, and Poisson's ratio. Interaction diagrams were presented for concretes made with two quick setting cements and fiber contents of 0.9, 1.2, and 1.5% by volume. Compressive failures, tensile failure, and simultaneous compressive-tensile failures were obtained depending on the moment to axial load ratio. A method was presented for determining the tensile stress-strain relationship for a length of beam immediately surrounding a crack. This tensile stress-strain relationship makes possible a computerized post-crack analysis of fiber reinforced concrete structures. Fiber content, fiber orientation, and type of cement appear to have little affect on Poisson's ratio but do influence the

modulus of elasticity and the strength. (Sims-ISWS)
W76-02545

8G. Materials

SURVEY OF CORROSION OF PRESTRESSING STEEL IN CONCRETE WATER-RETAINING STRUCTURES,
E. Phillips.
Australian Water Resources Council, (Camberra), Technical Paper No 9, 1975. 143 p, 9 fig, 10 tab, 4 plates, 214 ref, 4 append.

Descriptors: *Prestressed concrete, *Concrete pipes, *Water tanks, *Corrosion, *Australia, Concretes, Concrete structures, Concrete testing, Grouting, Reinforcement, Concrete technology, Failures, Cracks, Rupturing, Engineering, Surveys, Reviews.
Identifiers: *Concrete tanks, Steel wires.

The objectives of the survey were to: (1) identify the nature and mechanism of corrosion in prestressing wire in concrete water-retaining structures, and (2) assess the performance of structures in Australia with respect to corrosion, and compare failures reported abroad with those experienced in Australia. Information on Australian problems was obtained by discussions with engineers and through a questionnaire sent to all parties who were likely to be interested in the subject. Information on overseas failures was obtained by a literature survey and by attending the Federation Internationale de la Precontrainte (FIP) Symposiums on Stress Corrosion in Arnhem, Holland. Authorities on the subject were consulted on the way to and from Arnhem. In compiling this report, an attempt was made to collect and summarize all the available information on corrosion problems in prestressed water-retaining structures. Only the corrosion aspects were presented, but where information on repair procedure was available, it was included. A brief review of corrosion problems experienced in prestressed concrete structures other than reservoirs and pipes was also included. The report also had short sections on corrosion tests to determine the susceptibility of a steel to stress corrosion cracking or hydrogen embrittlement, on cathodic protection, other forms of protection, and surface potential measurements. The number of reported failures abroad is small compared to the total number of prestressed concrete units in use. Of over 83 wire-wrapped tanks constructed in Australia, only two reservoirs in Brisbane have suffered serious corrosion problems. (Sims-ISWS)
W76-02535

MEMBRANE EVAPORATOR/SUBLIMATOR INVESTIGATION,
AiResearch Mfg. Co., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-02538

MEMBRANE HUMIDITY CONTROL INVESTIGATION,
AiResearch Mfg. Co., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-02539

USE OF DOMESTIC WASTE GLASS FOR URBAN PAVING, SUMMARY REPORT,
Missouri Univ., Rolla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W76-02657

STUDY OF CORROSION PRODUCTS IN THE SEATTLE WATER DEPARTMENT TOLT DISTRIBUTION SYSTEM,
National Environmental Research Center, Gig Harbor, Wash. Northwest Water Supply Research Lab.
For primary bibliographic entry see Field 5A.
W76-02660

CALCULATION OF ICE-COVER BENDING ALLOWING FOR VISCOUS PROPERTIES OF ICE,
For primary bibliographic entry see Field 2C.
W76-02911

EVALUATION OF THE STRENGTH AND SEAKEEPING ABILITY OF POLLUTION CONTROL BARRIERS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-02929

8I. Fisheries Engineering

FISH LADDERS FOR JOHN DAY DAM, COLUMBIA RIVER, OREGON AND WASHINGTON,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
R. L. Johnson, and L. Z. Perkins.
Available from the Natonal Technical Information Service, Springfield, Va 22161 as ADA-000 332, $5.50 in paper copy, $2.25 in microfiche. Technical Report No 103-1, December 1968. 108 p, 17 fig, 35 plates, 14 tab, 1 ref.

Descriptors: *Fish ladders, *Model studies, *Hydraulic models, *Columbia River, Dams, Hydraulic structures, Weirs, Fish passages, Fish handling facilities, Fish management, Fish migration,Structures, Rivers, Hydraulic engineering, Laboratory tests.
Identifiers: *John Day Dam(Ore Wash).

Facilities for passing fish upstream over John Day Dam include a powerhouse collection system with fishway entrances at each end and along the downstream face of the powerhouse, and a 24-ft-wide fish ladder with 1-on-10 slope on both sides of the river. The north fish ladder (except entrance section) and a portion of ladder adjacent to the south fish counting were studied in a 1:10-scale model. A group of four typical diffusion chambers in each ladder was reproduced in a 1:8-scale model. Fishway weirs with 6-ft-long overflow crests at each end of a 12-ft-long nonoverflow section, upstream fins, and 18-by18-in. orifices at the floor were adopted. Orifice sizes in the regulating sections were adjusted to control discharge and head drops between 19 nonoverflow bulkheads for an 11-ft range in forebay levels. Sloping floors, baffle beams at a constant elevation, and metering orifices sized to provide 60 cfs each were selected for diffusers in sloping portions of the fish ladders. Improved designs were developed for the bulkhead and weir adjacent to the north fish counting station. The addition of a third orifice in bulkheads of the regulating section (to assist passage of shad and sockeye salmon) increased turbulence at the north fish counting station. The south fish counting station, with an illuminated vertical counting board, was satisfactory after the orifices in the adjacent downstream weir were enlarged to reduce head on the weir. (Sims-ISWS)
W76-02537

MODIFICATION OF FISH LADDERS, BONNEVILLE DAM, COLUMBIA RIVER, OREGON AND WASHINGTON,
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
L. Z. Perkins, and P. M. Smith.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-000 341, $5.50 in paper copy, $2.25 in microfiche. Technical Report No. 141-1, December 1973. 102 p, 11 fig, 38 plates, 4 tab.

Descriptors: *Fish ladders, *Bonneville Dam, *Model studies, Dams, Hydraulic structures, Weirs, Flow control, Fish passages, Fish handling facilities, Fish management, Fish migration, Management, Structures, Columbia River, Rivers, Hydraulic models, Hydraulic engineering, Laboratory tests.
Identifiers: Fish counting stations.

Modifications of the flow control sections and counting stations of the Bradford Island and Washington Shore fish ladders at Bonneville Dam were necessary to accommodate rapid pool changes which will result from fluctuating discharges caused by power peaking at hydroelectric projects upstream. Fishway operation for the extreme flood control pool range from elev 70.0 to elev 82.5 (feet above mean sea level) was considered. The normal range for design was between elev 72.0 and 80.0. A portion of the forebay, the exit control section, the counting station, the supply channel for auxiliary water, and typical sections of each ladder were studied in a 1:14-scale model. Hydraulically satisfactory designs for automatic control systems with vertical-slot nonoverflow walls, bleed-off and add-in diffusers, auxiliary water supply, movable-board underwater counting stations, and revised overflow weirs downstream were developed in the model. The designs for both ladders were operative with forebay levels between elev 70.0 and 76.5. Relatively simple modifications of those designs that could extend their range of operation to pool elev 80.0 were also developed. None of the plans was adequate at pool elev 82.5. (Sims-ISWS)
W76-02547

PRINCIPLES OF WATER QUALITY MANAGEMENT--11. FISHERIES AND AMENITY REQUIREMENTS,
Thames Conservancy, London (England).
H. Fish.
Effluent and Water Treatment Journal, p 586-597, September 1973, 12 ref.

Descriptors: *Protection, *Management, *Fisheries, *Water quality, Water pollution effects, Sport fishing, Freshwater fish, Marine fish, Salmonids, Europe, Anadromous fish, Catadromous fish, Recreation, Limiting factors.
Identifiers: England, Wales.

Management requirements of water quality of freshwater and marine fisheries in the United Kingdom are outlined for migratory and rough fish (salmon, trout, eels, and cyprinid coarse fish). Two major physical requirements of freshwater fisheries are suitable water temperature and its ability to transmit light, the latter necessary for sustaining the fishery's food supply. The effects of dissolved oxygen, carbon dioxide, pH, suspended solids, ammonia, phenols, cyanides, heavy metals, cadmium, and pesticides, are described. Tentative fish management guidelines for toxic constituents in water are that they should not exceed between 0.02 and 0.2 LC-50 (48 hours); that is, not greater than 0.02 for salmon and trout fisheries; not greater than 0.05 for very good trout and coarse fisheries; not greater than 0.1 for reasonably mixed coarse fisheries; and not greater than 0.2 for coarse fisheries of relatively low value in terms of fish sizes and variety of species. The major concern of water quality management for the protection of sea fisheries in estuarine and coastal waters is the control of pollution, the maintenance of an adequate oxygen saturation, the protection from the effects of heated discharges, and toxic and tainting substances. The amenity requirements for various recreational activities are also discussed. (Auen-Wisconsin)
W76-02653

A MODEL OF ALEWIFE MIGRATION IN THE PARKER RIVER, MASSACHUSETTS FOR

SIMULATING AN OPTIMAL ANADROMOUS FISH STOCK MANAGEMENT PROGRAM,
Massachusetts Univ., Amherst. Water Resources Research Center.
G. Libey, C. F. Cole, and J. E. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 405, $4.00 in paper copy, $2.25 in microfiche. Water Resources Research Center Pub No 57, Completion Report FY-76-4, Sept 1975. 25 p, 4 fig, 3 tab, 22 ref. OWRT A-054-MASS(1). 14-31-0001-5021.

Descriptors: Fish management, *Fish stocking, *Fish migration, *Massachusetts, *Anadromous fish, Model studies.
Identifiers: *Alewife migration, Parker River(Mass).

Biological and physical data were collected on anadromous alewife (Alosa pseudoharengus) migration into the Parker River, Essex County, Massachusetts. These data were the basis for constructing a model of the migration. The model, when fully developed, will provide a sufficiently realistic simulation that can be utilized by regulatory agencies as an aid in anadromous fish stock management in the Parker River and similar rivers elsewhere.
W76-02868

10. SCIENTIFIC AND TECHNICAL INFORMATION

10D. Specialized Information Center Services

ENGINEERING DESIGN HANDBOOK, ENVIRONMENTAL SERIES, PART ONE, BASIC ENVIRONMENTAL CONCEPTS.
Army Materiel Command, Alexandria, Va.
For primary bibliographic entry see Field 06G.
W76-02550

CHRIS APPENDIXES I-VI. (PRELIMINARY SYSTEMS DEVELOPMENT-CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM-CHRIS)
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05A.
W76-02552

THE ARIZONA RESOURCES INFORMATION SYSTEM - 1975,
Arizona Resources Information System, Phoenix. Dept. of Revenue.
For primary bibliographic entry see Field 06B.
W76-02736

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W76-02997	2G
W76-02998	3F
W76-02999	3F
W76-03000	3F

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W76-02872	1
Cornell University, Policy Models for Water Resources Systems	W76-02713--02718 02720--02722 02876--02880	14
East Central Oklahoma State University, Agricultural Livestock Wastes	W76-02990	1
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W76-02561--02571 02573--02587 02589 02591--02593 02654, 02771 02773--02779 02781--02811 02813--02847 02849--02863 02873--02875 02973--02984 02986	136
Illinois State Water Survey, Hydrology	W76-02534--02560 02680--02712 02901--02908 02910--02941 02943--02946	104
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W76-02504--02512 02514--02522 02947--02948	20
University of Arizona, Arid Land Water Resources	W76-02523--02533 02663--02679 02723--02731 02735--02756 02968--02971	63

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University of Wisconsin, Water Resources Economics	W76-02613 02616--02626 02640--02653	26
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W76-02627--02639 02733 02864--02871	22
C. OTHER		
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Environmental Protection Agency	W76-02501--02503 02657--02660 02662 02757--02769	21
Ocean Engineering Information Service (Patents)	W76-02594--02599 02601--02612 02991--02992 02995--03000	26
Office of Water Research and Technology	W76-02734	1
U. S. Geological Survey	W76-02655--02656 02949--02950 02952--02955 02957--02967	19
Vanderbilt University, Metals Pollution	W76-02780, 02812 02881--02883 02885--02896	17

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